



AGRICULTURAL RESEARCH INSTITUTE
PUSA



Her Majesty Queen Victoria

BORN 24TH MAY 1819. DIED 22ND JANUARY 1901.

ASCENDED THE THRONE 20TH JUNE 1837.

Photo by Lafayette, Dublin (April 1900)

TRANSACTIONS
OF
THE HIGHLAND AND AGRICULTURAL
SOCIETY OF SCOTLAND

WITH
AN ABSTRACT OF THE PROCEEDINGS AT BOARD AND GENERAL
MEETINGS, AND THE PREMIUMS OFFERED BY
THE SOCIETY IN 1901

PUBLISHED ANNUALLY



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TRANSACTIONS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND .

Queen Victoria

THE Victorian era has outlived the "old century" but three short weeks and a day. In companionship not unfitting they have glided away into memory—a century unparalleled in the history of the world, a reign the greatest, most brilliant, most beneficent in the chronicle of kings. The passing of the one aroused an interest full of pathos, of the other a depth and breadth of feeling no man can measure. "My beloved mother, the Queen, has just passed away, surrounded by her children and grandchildren." This mournful message—sent to the Lord Mayor of London from Osborne House on the evening of Tuesday, 22nd January of the present year, by the Prince of Wales, now Edward VII., King of Great Britain and Ireland—touched the heart of humanity as the heart of humanity had never been touched by any message of similar import.

It is a wonderful thing to say—though it has been said with perfect truth—that never before was the demise of man or woman mourned with sincerity over such a wide area of the great universe or by such vast masses of people as has the closing of the life of our beloved Queen. Yet no one has asked how

this came to be, so natural, so befitting does it all seem to those who know the life, the character, the good deeds done, the kind words spoken by the great Sovereign who has laid down her sceptre and entered into rest eternal. Other monarchs, other women have been, like her, good and great and wise, yet, beyond and above all monarchs, all men and women who have gone before, "the Great White Queen" came to be loved, trusted, and honoured by the peoples of the earth. To her own people, her own subjects at home and abroad, of all races and all creeds, of all states and stations, she was more as a sovereign, more as a friend—in a domestic, family, personal sense, vastly more—than was the greatest, the best, and most gifted of all the earlier crowned heads the world has known. Others beside her own subjects sought to bear her friendship, honour, affection. Truly enough is it said that even those who loved not our country loved our Queen.

The most gifted writers, the ablest statesmen, and the greatest orators in the land have vied with each other in extolling the virtues of Queen Victoria and the glories of her reign. Much has been written and spoken and yet the theme is not exhausted. Its adequate treatment awaits the calm discriminating historian. In the pages of this book nothing more is attempted than a humble tribute of dutiful respect and affection to a Queen who had a particularly warm corner in her great kindly heart for the classes engaged in agriculture. With pride and affection British agriculturists spoke of their Queen as "a farmer like themselves." In times and ways without number they had evidence of the sympathetic interest with which her Majesty watched the ebb and flow of their calling. She grieved with them in their adversity, rejoiced with them in their prosperity. It was but the other day there was read at a meeting of our own Board a characteristic expression of the gratification the Queen derived from the success which attended the Highland Show at Stirling last July. The Queen's own operations as a farmer and stock-breeder, and her personal efforts to promote improved agriculture, formed the subject of a paper in the volume of 'Transactions'¹ for 1897, and it may interest some to read at this time what was written then.

¹ "Queen and Farmer" in vol. ix., Fifth Series.

Among the many graceful and fitting tributes which have been paid to the life and character of our late Queen, one that will be specially appreciated by Scotsmen is that which the First Lord of the Treasury, Mr Arthur James Balfour, addressed to the House of Commons three days after the death of her Majesty. The members of this Society will, I feel sure, be gratified to have the greater part of that tribute presented here. "I suppose," said Mr Balfour, "that in all the history of the British monarchy there never has been a case in which the feeling of national grief was so deep-seated as it is at present—so universal, so spontaneous. And that grief affects us not merely because of the loss which has fallen upon us, but because we feel, as it were, that the end of a great epoch has come—an epoch the beginning of which stretches far beyond the memory of any individual, I suppose, whom I am now addressing, and which embraces within its compass sixty-three years, I venture to think more important, more crowded with great change than almost any other period of that length that could be selected in the history of the world. It is wonderful to think that when so many among all the great changes now familiar, and almost vulgarised by constant discussion and repetition, were yet untaught or undeveloped, these great industrial inventions, these great economic changes, these great discoveries in science now in all men's mouths—before all these were, I say, developed, Queen Victoria reigned over this empire. It is not simply the length of the reign, it is not simply the magnitude of the events with which that reign is filled, which has produced this deep and abiding emotion which has stirred every heart throughout the kingdom. The reign of Queen Victoria is no mere chronological landmark; it is no mere convenient division of time useful for the historian or the chronicler. No, sir, we feel as we do feel for our great loss, because we intimately associate the personality of Queen Victoria with that great succession of events which have filled her reign, and with the development of that empire over which she rules. But, sir, in so associating her personally with these events we surely do well. In my judgment, the importance of the Crown in our Constitution is not a diminishing but an increasing factor. It is increasing and must increase with

all the growth and development of those free self-governing communities, those new Commonwealths beyond the sea, which are bound to us by the person of the Sovereign, and who are the living symbol of the unity of the empire.

"But, sir, it is not given—it cannot in ordinary course be given—to a constitutional monarch to signalise his reign by any great isolated action. The effect of a constitutional sovereign, great as it is, is produced by the slow, constant, and cumulative result of a great ideal and a great example, and Queen Victoria surely was the first of all constitutional monarchs whom the world has yet seen. Where shall we find an ideal so lofty in itself, so constantly and so consistently maintained through two generations, through more than two generations of her subjects, through many generations of her public men and members of this House?

"Sir, it would be almost impertinent for me were I to attempt to express to the House in words the effect which the character of our late Sovereign produced upon all who were in any degree, however remotely, brought into contact with her. Her simple dignity, befitting a monarch of these islands, of this realm—in that she could never fail, because it arose from her inherent sense of the fitness of things. It was no trapping put on for office, and therefore it was that this dignity, this queenly dignity, only served to throw into higher relief and into a brighter light those admirable virtues of the wife, the mother, and the woman with which she was so richly endowed. Those kindly graces, those admirable qualities, have endeared her to every class of the community, and are known to all.

"Perhaps less known was the life of continuous labour which her position as Queen threw upon her. Short as was the interval between the last trembling signature affixed to a public document and the final rest, it was yet long enough to clog and hamper the wheels of administration; and I remember when I saw the vast mass of untouched documents which awaited the hand of the Sovereign of this country to deal with, it was brought vividly before my mind how admirable was the unostentatious patience with which for over sixty-three years, through sorrow, through suffering, in moments of weariness, in moments of despondency it may be, she had carried on without intermission her share in the government of this empire. To her there was no holiday, to her there was no intermission of toil. Domestic

sorrow, domestic sickness made no difference in her labours, and they were continued from the hour at which she became our Sovereign to within a very few days of her death. Sir, it is easy to chronicle the growth of the empire, the progress of trade, the triumphs of war, all the events that make history interesting or exciting, but who is there that will dare to weigh in the balance the effect which such an example continued for sixty-three years must produce upon the highest life of the people?

"Sir, it is a great life, and it had the fortune, let me say in my judgment, of a happy end. The Queen had her reward in the undying affections and the immemorial recollections of all her subjects wheresoever their lot might be cast. This has not always been the fate of her ancestors—it has not been the fate of some of the greatest among them. It has been their less happy destiny to outlive, as it were, their fame, to see their people's love grow cold, to find a new generation growing up around them who knew them not, and problems awaiting solutions with which they felt themselves incapable of dealing. Their sun, once so bright, had set amid darkening clouds and the mutterings of distant storm about to break. Such was not the destiny of Queen Victoria. She passed away with her children and her children's children to the third generation around her, beloved and cherished by all. She passed away without, I believe, a single enemy in the whole world—for even those who loved not England loved her—and she passed away not only knowing that she was, I had almost said worshipped and revered by all her subjects, but that their feelings towards her had grown in depth and intensity with every year in which she was spared to rule over us. No such reign, no such ending has been known in our history before."

Throughout the great and universal wave of sorrow, called forth by the death of the Queen, there has been one all-pervading note of comfort and consolation. "The Queen is dead; long live the King!" The sceptre which fell from the hand of Queen Victoria is now held by her first-born son. Words which will long live in the memory of those who heard them and those who have since read them were spoken by King Edward VII. to his first Privy Council at St James's Palace on Wednesday, 23rd January. They are as follows:—

"Your Royal Highnesses, my Lords, and Gentlemen,—This is the most painful occasion on which I shall ever be called upon to address you.

"My first and melancholy duty is to announce to you the death of my beloved mother the Queen; and I know how deeply you, the whole nation, and I think I may say the whole world, sympathise with me in the irreparable loss we have all sustained.

"I need hardly say that my constant endeavour will be always to walk in her footsteps. In undertaking the heavy load which now devolves upon me, I am fully determined to be a constitutional Sovereign in the strictest sense of the word, and as long as there is breath in my body to work for the good and amelioration of my people.

"I have resolved to be known by the name of Edward, which has been borne by six of my ancestors. In doing so, I do not undervalue the name of Albert, which I inherit from my ever-to-be-lamented great and wise father, who by universal consent is, I think, deservedly known by the name of Albert the Good, and I desire that his name should stand alone.

"In conclusion, I trust to Parliament and the nation to support me in the arduous duties which now devolve upon me by inheritance, to which I am determined to devote my whole strength during the remainder of my life."

The members of this Society need no words at this time to recall to them the life of the Royal Prince who has now become our King. "I am fully determined as long as there is breath in my body to work for the good and amelioration of my people." Gracious and becoming words surely from one whose busy life of fifty-nine years has been spent in the constant and untiring service of the country over whose destinies he is now called to reign.

In the 'Times' of Wednesday, 23rd January 1901, there appeared the following under the title "The King: A Loyal Appreciation":—

"He who was until yesterday the Prince of Wales, and who will be, by the force of habit, still thought of as such for some time to come, has endeared himself, during the many years of his long novitiate, to all classes of his subjects. In the whole range of English social and political life there is no position more difficult to fill satisfactorily and without reproach than

that of Heir Apparent to the Throne, and it may be justly said that the way in which that position has been filled for more than the ordinary lifetime of a generation has contributed to the remarkable increase of devotion to the Throne and the dynasty which is one of the most striking characteristics of Queen Victoria's reign.

"In the relations of private life, from his childhood upwards, 'the Prince' has been universally and deservedly popular. Cheerful and amiable, kind and generous, ever ready to sympathise with the joys and sorrows of those around him, a true friend and a loyal antagonist, possessing considerable mental culture and wide intellectual sympathies without any tinge of pedantry, he has represented worthily the type of the genuine English gentleman. Though a lover of sport, like most of his countrymen, he differed from some of them in never regarding it as the chief interest and occupation in life. If he had been born in a humbler station he might have become a successful business man or an eminent administrator, for he possesses many of the qualities which command success in such spheres of action. He is a quick and methodical worker, arranges his time so as never to be hurried, is scrupulously conscientious in fulfilling engagements, great and small, with a punctuality which has become proverbial, never forgets to do anything he has undertaken, and never allows unanswered letters to accumulate. Few men have a larger private correspondence, and his letters have the clearness, the directness, the exquisite tactfulness, and the absolute freedom from all affectation which characterise his conversation. Since the beginning of the war in South Africa many a bereaved father, mother, sister, and brother, with whom he happened to be personally acquainted, has received from him consoling words of genuine sympathy. In public life he has displayed the same qualities and done a great deal of very useful work. The numerous and often irksome ceremonial duties of his position have been invariably fulfilled most conscientiously and with fitting dignity. Of the remainder of his time a considerable part has been devoted to what might be called semi-official activity. In works of benevolence and public utility and in efforts to promote the interests of science and art he was ever ready and anxious to lend a helping hand. He never forgot, however, that in his public appearances he had not the liberty of speech and

action enjoyed by the ordinary Englishman. Whilst taking the keenest interest in public affairs of every kind, he carefully abstained from overstepping in the slightest degree the limits imposed on him by constitutional tradition and usage. No party clique or Court camarilla ever sheltered itself behind him, and no political intrigue was ever associated with his name. Throughout her dominions Queen Victoria had no more loyal devoted subject than her own eldest son.

"If this strictly correct attitude had been confined to his relations with the Head of the State we might have supposed that it proceeded from a feeling of deep filial affection and reverence, but as it was displayed equally in his relations with Parliament and politicians, we must assume that it proceeded also from a high and discriminating sense of duty. Of the Prime Ministers, leaders of her Majesty's Opposition, and politicians of minor degree with whom he came in contact, he may have found some more sympathetic than others, but such personal preferences were carefully concealed in his manner, which was invariably courteous and considerate, and were not allowed to influence his conduct. On certain subjects which had necessarily a political bearing he may have held strong views, but these related to questions in which the honour or vital interests of the country were concerned, and on such occasions he was always in harmony with the best section of enlightened public opinion. From indulging in foolish extremes he was restrained by good taste as well as by sound judgment. In these circumstances it is evident that the demise of the Crown at the present moment, however deeply it may plunge the nation at large in grief, will not be attended with the direct political consequences which it might have had a century ago. As Albert Edward has been a scrupulously constitutional Prince of Wales, we may confidently predict that Edward VII., if that should be the style he will assume, will be a scrupulously constitutional King, and we have no doubt that his personal influence within the limits prescribed by the Constitution will be exercised in maintaining the honour and protecting the interests of the world-wide Empire over which he is called to rule. In the fulfilment of this onerous task he will have by his side a Queen who has the virtues and goodness as well as the feminine graces befitting her exalted station, and who is already enthroned in the hearts of her loving subjects."

The following address to his Majesty the King was adopted at a meeting of the Directors of the Society held on 6th February :—

"Unto the King's Most Excellent Majesty.

"MOST GRACIOUS SOVEREIGN,

"We, your Majesty's most dutiful and loyal subjects, the Highland and Agricultural Society of Scotland, incorporated by Royal Charter, humbly desire to approach your Majesty with an expression of our heartfelt sympathy with your Majesty, your Royal Consort, and the other members of your Royal House, on the occasion of the lamented death of our revered and beloved Sovereign, Queen Victoria.

"We cherish with grateful memory the charms of character which illumined the life of our departed Queen, the warmth and goodness of heart which moved her to share joys and sorrows with her people in every rank and station, the love and fostering care she offered to all that is pure, good, and elevating in the life of the family, the social circle, and the nation, the rare example of her unceasing devotion to duty, the wisdom, enlightenment, and unswerving rectitude of her reign, which mark the Victorian era as the most illustrious and beneficent in the history of the world.

"To your Majesty we would humbly offer our warm and sympathetic congratulations upon your elevation to the throne of this great empire. Recalling with earnest thankfulness your Majesty's great and devoted services to the nation in the past, we anticipate with highest hopes that the reign of your Majesty will be as distinguished and glorious in the annals of our country as has been that of our late ever-to-be-revered Monarch. We assure your Majesty of our affectionate attachment and loyalty to your Majesty's throne and person, and we fervently pray to Almighty God that your Majesty and your Royal and well-beloved Consort may long be spared to rule over a happy, loyal, and united people.

"Sealed with the corporate seal of the Society, and signed on its behalf by Alexander M. Gordon of Newton, Aberdeenshire, chairman of the Society's Board of Directors, and James Macdonald, secretary, this the 6th day of February 1901."

Mr Alexander M. Gordon of Newton, in moving the adoption of the address, spoke with appropriate feeling of the warm affection of the people for the Mother-Queen of the empire, and alluded to the vivid interest her Majesty took in all matters relating to agriculture.

JAMES MACDONALD.

ERADICATION OF CHARLOCK IN CORN CROPS BY SPRAYING.

By Professor SOMERVILLE, University of Cambridge.

CHARLOCK is rightly regarded as one of the most troublesome weeds of cultivation. It is known in different parts of the country as karlock, runches, skellock, wild mustard, yellows, yellow weed, &c., while scientifically it bears the names *Brassica Sinapis* Vis., *Brassica Sinapistrum* Boiss., and *Sinapis arvensis* Linn. Its range embraces the whole country, though it is not alike abundant throughout. It seems to be equally at home on light and on strong land, and if it is perhaps most conspicuous on sandy and gravelly soil, this is probably due to the fact that corn crops are apt to be light under such circumstances, so that weeds become correspondingly prominent. Certain it is that there are instances enough of charlock being abundant and vigorous on strong loams and heavy clays, nor, within the limits of cultivation in the British Isles, does latitude or longitude, elevation or any other natural condition, appear to have much influence on its growth. That there are farms and districts where charlock is hardly troublesome goes without saying, but in such cases the weed is inconspicuous solely in consequence of unremitting attention to eradication during a long period of years, and as a result of the persistent practice of the best methods of agriculture.

Nature of the Injury.

The injury induced by charlock is partly direct and partly indirect. It is directly injurious to corn and other crops owing to its competing with them for light, air, plant-food, and moisture. It is not infrequently so abundant as to overgrow and smother the crop-plants with which it is associated. But serious as is its direct influence, the damage which it indirectly causes is probably no less important. More particularly, it is the means of propagating certain injurious insects and plant-diseases, which, but for charlock, could not, in many cases, exist. The turnip flea-beetle, for instance, could hardly exist between one turnip crop and another, were it not for the charlock plants, on which it can live and breed during the intervening years. Similarly in the case of the turnip gall-weevil, which is often found in the roots of charlock.

Then, again, the fungus that causes finger-and-toe cannot fail

to be kept alive and active if it finds abundance of charlock plants on which to feed during the years that intervene between two turnip crops. If the corn crops before and after turnips be fairly intermingled with charlock, it means that in a four-course rotation there is only one year in four when the land is not occupied by cruciferous plants, and there is not much land that can stand such treatment without showing finger-and-toe. In point of fact, charlock contracts this disease very readily, which, however, appears to be unable to kill off such wild plants so easily as is the case with cultivated and therefore less-resistant plants.

Occurrence of Charlock.

The plant under notice is an annual, agreeing in this respect with such well-known weeds of cultivated land as wild poppy, fumitory—that pretty little pink-flowered, ragged-leaved weed of the Border counties—goosefoot—whose mealy stem often attains a height of 5 or 6 feet in the fat loams of the Lothians—and spurry or “yar”—regarded as a most troublesome weed in most districts of Scotland, but cultivated as a fodder crop for sheep in many parts of the Continent. Charlock can spread in one way only, and that is through the agency of seed; and if it is often abundant in a crop grown on land that has not shown a charlock flower for years, that is only because the seed, through its richness in oil, can lie dormant but vital for long periods. For instance, pasture that has been sown for some years seldom shows so much as a single plant of charlock, and yet it may happen that when such land is again put under the plough, and buried seeds are given suitable conditions for germinating, the whole field may be thickly beset with it. Or extra deep ploughing, disturbing, as it does, 2 or 3 inches of fresh soil, may bring to the surface a supply of weed-seed sufficient to pollute the field for many years.

Charlock may be met with in all crops of arable land, though it is generally very scarce amongst hay. Nor is it usually abundant in winter wheat, for the reason that the plants that spring up in autumn are killed by frost, while those that appear in spring are at once smothered by the cereal. Although charlock shows itself freely enough amongst turnips, potatoes, and similar “green” crops, it can there easily be dealt with by hand and horse hoeing. It is amongst spring-sown corn crops—especially oats and barley—that this weed is most abundant, and it is under these circumstances that it may assume the proportions of a pest of the first magnitude, and do a very serious amount of damage.

Methods of combating Charlock.

Up to within the last three years farmers attempted to combat this weed in a variety of ways, but with only moderate success. If the corn crop has been sowed in wide drills it may be possible to kill this and other weeds by hand or horse hoeing, but in Scotland spring-corn is seldom drilled, and in any case about half the total area is sowed with grass and clover seeds, so that hoeing of any kind is completely prevented.

Modifications of the ordinary methods of cultivation are sometimes resorted to in order to combat this weed. For instance, the land may be harrowed down about the beginning of March, and if the weather of the next two or three weeks is mild a considerable proportion of charlock seed is induced to germinate, and the resulting plants can afterwards be got rid of by ploughing or harrowing, the grain being subsequently sown. But strong land is apt to suffer seriously in texture by being harrowed down flat some weeks before a crop is sown; and for this, and other reasons, this method of combating charlock is capable of very restricted application. Machines of various kinds have from time to time been devised for dealing with this weed, that which finds most favour consisting of a rotating drum or hollow cylinder, carrying a series of comb-like teeth, which catch the stem, or at least the flower, of the charlock, and pull it out of the ground or otherwise injure it. But as much of the damage due to charlock has been done by the time the plants are sufficiently large to be dealt with by such a machine, its use is of the nature of a prevention rather than a cure, and comparatively few are in use.

Discovery of Eradication by Spraying.

It was in the summer of 1897 that a Frenchman, M. Aime Girard, published the results of experiments he had carried out on the effects on charlock of a 5-per-cent solution of copper sulphate, pointing out that whereas the leaves of this plant, being rough and horizontally disposed, absorb the solution and are killed, the leaves and stalks of corn-plants, being smooth and erect, allow the poison to run off and so escape injury. Shortly afterwards M. Bernard suggested that a 25-per-cent solution of sulphate of iron would prove equally effective, and might, in addition, be directly beneficial to the grain crop with which the charlock is mixed.

In the summer of 1898 experiments were conducted at two or three places in this country with the view of testing the value of the discovery. The results obtained in that year were so encouraging that in 1899 the majority of agricultural colleges,

and a number of county councils, carried out demonstrations, and the matter attracted widespread notice. During the past three seasons solutions of the sulphates of iron and copper have been tested of varying strength and in varying amounts per acre, and while there are not wanting cases of failure—partial or complete—the great mass of the evidence proves conclusively that farmers have now been supplied with an agent that is capable of rendering valuable service in the eradication of a pest that has long held its ground most tenaciously.

Solutions employed.

It would serve no useful purpose were we to describe the many experiments and experimental results of the past three years. They have all been conducted on the same main lines, and all have centred round the same object. While specially weak solutions, or a specially small quantity of solution per acre, have here and there given satisfactory results, there is no doubt that for general use the standard dressing should be 40 gallons per acre of a 4-per-cent solution of copper sulphate, or a 15-per-cent solution of iron sulphate. To make the former 16 lb. of material are dissolved in 40 gallons of water, while, in the latter case, 60 lb. of iron sulphate are wanted for the same amount of water. Used in these quantities per acre no cereal will be injured beyond a possible temporary brownness at the tips of the leaves; and although peas and beans will show more markedly the effects of the treatment, it is doubtful if they are to any extent permanently injured.

For spraying charlock mixed with peas and beans, however, it will be desirable not to go beyond a 3-per-cent solution of copper sulphate, or a 12-per-cent solution of iron sulphate. But the stronger solutions may be used with confidence for the treatment of cereals, as any little brownness of the leaves soon disappears, and the corn-plants are ultimately darker green and more robust than before. Whether this increase of vigour, which is usually observed to follow the spraying of a corn crop, is due to the benefits consequent on the removal of the charlock, or is the direct result of what we may call the "tonic influence" of the sulphate on the cereal plants, has not been definitely determined. We know that the vigour of potato plants is markedly increased by spraying with copper sulphate, and this, apart altogether from the question of prevention or mitigation of disease. It seems reasonable, therefore, to suppose that cereal plants may be similarly benefited, though there can be no doubt that the improved growth that follows spraying is largely due to the suppression of the competing weeds.

Direct and indirect manurial effect has also been attributed

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to iron sulphate; in fact it has not infrequently been used and recommended as a manure. But it is hardly likely that 60 lb. per acre of iron sulphate can have any appreciable influence in this way, so that, from the point of view of spraying, any manurial effects may be disregarded. At one time it was feared that the two substances just referred to might have an injurious influence on young clover and grass occupying the ground along with the cereal; but in no instance has this been found to be the case.

Although the sulphates both of copper and iron have been proved to be alike effective as destroyers of charlock, there are certain advantages associated with the use of copper sulphate. Firstly, it is more convenient to dissolve 16 lb. of copper sulphate in 40 gallons of water than it is to effect the solution of 60 lb. of iron sulphate. The expenses of manipulation are therefore less in the former case. Secondly, copper sulphate hardly changes even during a long period of storage, whereas iron sulphate rather rapidly oxidises—as is shown by its changing from green to brown—and thus becomes unsuitable for the object in view. Thirdly, copper sulphate injures the clothes of the workmen less than iron sulphate.

On the ground of expense there is not much to choose. A short time ago copper sulphate could be bought for 20s. per cwt., iron sulphate costing about 4s. At these prices 40 gallons of a 4-per-cent solution of the former, or of a 15-per-cent solution of the latter, cost respectively 2s. 10d. and 2s. 2d. At present copper sulphate is probably nearly 30s. per cwt., while iron sulphate may be about 5s. At these prices the standard dressing of the former would cost about 1s. 7d. per acre more than in the case of the latter.

While 40 gallons per acre of a 4-per-cent solution of copper sulphate will generally give satisfactory results, it cannot be said that it will destroy the whole of the charlock, even when it is applied under the most favourable circumstances. A certain number of plants, owing to protection by the cereal, or unequal distribution of the solution, will fail to come into contact with the poison. An even larger number of plants will be merely crippled, and will still retain vitality enough to produce a few flowers and bear a little seed. But the result of applying the quantity of solution indicated above is usually very conspicuous, and it may generally be expected that the amount of charlock and its seed-production will be reduced by at least 80 per cent.

Varieties of Charlock.

It sometimes happens, however, that spraying has very little effect on charlock, and this for various reasons. The weed may

be too small or too large at the time of treatment, or rain may wash the material off the leaves before the poison has had time to act. But in other cases failure is due to the fact that the charlock is not *Brassica Sinapis* Vis., but some other nearly allied Crucifer, such as *Brassica campestris* Linn., the wild swede or wild rape, with a smoother leaf and a paler flower than *B. Sinapis*; or *Raphanus Raphanistrum*, the wild radish or white charlock, with a white or whitish flower. Some botanists would confine the term "runch" to the last of these species, but in popular language—and the term is only popular—"runch" is applied to all three, and possibly also to other species. All these plants show considerable variety of character, but it may be said that any kind of "runch," whose leaves are destitute, or nearly destitute, of hairs, is not much affected by spraying either with copper or with iron sulphate. The effectiveness of the solution, in fact, appears to depend largely upon the way in which it is retained by the hairs or other roughness on the surface of the leaf, and for this reason other rough-leaved weeds, such as thistles, are also more or less injured by this form of treatment. On the other hand, smooth-leaved weeds, such as docks and coltsfoot, are not much affected. It cannot be said, however, that any perennial weed is seriously damaged by spraying, for, although the foliage may be temporarily destroyed, reserve food is rapidly sent up from the stores in the root-stock, and a fresh supply of leaves is quickly produced.

Variations in Treatment.

While failure may occasionally be looked for, and the success attendant on a single spraying is, at the best, only partial, the benefits are generally so obvious as to give satisfaction. But a greater measure of success, though at increased expenditure on material and labour—and accompanied by somewhat more damage to the crop, occasioned by the trampling of the horses or men, or the passage of the wheels of the machine—will attend a double spraying. In this case the solution need not exceed a strength of 3 per cent, which, for two dressings, would amount to 24 lb. of copper sulphate per acre.

In order to reduce the labour somewhat, it has been suggested that about 30 gallons of a 5-per-cent solution might be as effective as 40 gallons of a 4-per-cent solution. But in practice it is found that less than 40 gallons per acre cannot be equally distributed; in fact, if the water-supply is very convenient, 16 lb. of copper sulphate applied in 60 gallons of water (a 2½-per-cent solution) will give a better result than the same quantity of material in a smaller amount of water.

Time to Spray.

The ideal time to spray charlock is when the plant is 2 to 3 inches in height—usually, in Scotland, in the beginning of June—at which stage it is generally beginning to show the flower-buds amongst the upper leaves. Nothing is to be gained by spraying when the plants are very small, as at that stage a certain proportion will still be in the smooth seed-leaf condition, and it is only after the “rough leaf” has been developed that the poison is thoroughly effective. It may be, too—more particularly in the case of winter wheat—that when the charlock plants are very young they are so much covered over by the cereal as to be largely protected against contact with the solution.

Then again, care must be taken to prevent the charlock becoming too old before treatment. There are undoubtedly numerous cases of charlock well in flower being successfully sprayed, but, as a rule, charlock so old as that, though severely crippled, is not altogether prevented seeding. Moreover, the corn crop is more liable to injury when it is trampled on in advanced growth.

General Hints.

In forming the solution it is desirable that soft water should be used. The water should also be thoroughly clean, or otherwise the fine apertures of the machine are apt to be blocked.

Cases have lately occurred where copper sulphate contained a considerable admixture of the iron salt. The material should therefore be bought under a strict guarantee of 98 per cent of purity—the standard for the commercial article. It should also be bought in a ground—that is, powdered—condition, as this greatly facilitates solution. It is convenient, when the work of spraying is in progress, to have two 40-gallon barrels or tubs in use, so that while the solution in one is ready for use, that in the other may be in course of preparation. Ordinary metal pails will not long resist the action of the solution, and it is therefore desirable to use wooden vessels.

There is not a very large choice of spraying-machines, and it may be said that any machine that can be used for potatoes may be adapted for charlock. It often happens that a farmer has only a few acres of badly infested corn, in which case a good hand-machine may be used, which—if the work of supplying the solution to the sprayer is arranged so as to avoid delay—should get over 3 to 4 acres daily. For the treatment of large areas, however, resort must be had to a horse-machine, which not only covers a much larger surface (20 to 30 acres daily) but

applies the solution more equally and effectively. As a breadth of about 20 feet is taken by such a machine, and as the spray is delivered close to the ground, the work is less interfered with by wind. Moreover, the solution is generally delivered from a horse-machine in a finer spray than from a machine worked by hand. From every point of view the horse-machine is to be preferred, and it may be expected that it will soon be possible, in most districts, to hire such machines for use on charlock and potatoes.

The best Weather.

No work that can be undertaken on the farm is more dependent on the absence of wind than the spraying of charlock. A still day is therefore a necessary condition of success. Nor should the work be undertaken or pursued in unsettled weather. The spray will be quite as effective if applied when the crop is damp as when it is dry, but much rain immediately after spraying is fatal to success. Bright sunshine is not so suitable as a clouded sky; in fact a dull misty day, but without rain, offers the most suitable weather of all. Under these circumstances the solution remains for a long time in a liquid condition in contact with the charlock leaves, which consequently absorb more, and suffer more, than if the spray is dried up within a few minutes after application.

Possible Developments.

So far, in this country, attention has almost exclusively been given to the application of solutions of the sulphates of copper and iron; but Dr Bernard Dyer has recently called my attention to an article by Mons. C. Dusserre in the 'Chronique Agricole du Canton de Vaud,' part 12, 1899, in which spraying with nitrate of soda is recommended. Using a 20-per-cent solution of nitrate of soda at the rate of 100 gallons per acre (200 lb. per acre of nitrate), Mons. Dusserre found that the charlock was satisfactorily destroyed, while the ultimate effect on the cereal was, as was to be expected, very beneficial. So far as I am aware a spray of this kind has not yet received a thorough trial in this country, but it is evident that if we can, by one and the same operation, destroy weeds and top-dress our crops, a considerable step forward will have been taken. It is to be hoped that spraying with nitrate of soda, sulphate of ammonia, and possibly other manurial agents, will get an extended trial in this country during the coming season; and, in any case, it is evident that the destruction of weeds by spraying is worthy to be classed amongst the useful agricultural discoveries of the nineteenth century.

THE FARM-LABOURER'S COTTAGE.

By RICHARD HENDERSON, F.H.A.S., Portland Estates Office, Kilmarnock.

THE lack of house accommodation for married labourers has no doubt something to do with the universally deplored tendency of our rural population townwards. So, too, must the uncomfortable condition of much of that accommodation which is at their disposal.

There is no cry in Scotland for allotments, either as a bribe to content farm-labourers with their present lot or as a bait to lure men from the towns. Our systems of farm management are such as to demand the constant attendance of the hired hands. They could not be followed unless steady labour were available. The work of the farm would become hopelessly disorganised if the labourers were free to turn up one day and on another to see after their own affairs. To men, therefore, whose whole time is engaged in this way the offer of allotments is a mistaken kindness. After nine or ten hours' employment in the fields no man should be tempted to resume the hard work that the cultivation of an allotment implies.

With the orra-man (the handy-man of the place)—the man who works by the day and is paid accordingly—matters are different. But even in his case the allotment is often much of a snare. At the times his services are most in demand at the farm, the allotment calls loudest for his attention. If the Scottish farm-labourer, then, has so few demands in connection with the soil, it cannot be difficult, one would think, to meet him more than half-way in these.

On the large estates where the proprietors for long have had and still do exercise a paternal interest in the dwellers thereon, the want of houses for labourers is seldom felt. There, as a rule, the farm cottages are both plentiful and of a very comfortable description. And sometimes they are of artistic design as well. Too few of them, perhaps, come under the last category, which is a pity, for they might as well have been pleasing to the critical eye. The proprietor who sanctions the erection of a superior cottage as regards both room and comfort, will never, we are sure, object to a little additional outlay in judicious outer adornment.

It is not there, however, that the pinch is felt. The want of the accommodation we refer to lies in quarters where the proprietorship is either nominal or is exercised in deputy by those who are unacquainted with, or, what is worse, not concerned

about, the social conditions of the tillers of the soil. And where it is scarcest, there too it is of the poorest description.

The matter is very much one of money, however, and no man is altogether to blame for not supplying houses who is without the means of doing so. But where there is a will there is, as we shall see, a way; so, on the whole, no very valid excuse is forthcoming for a sparsity of cottages on the farm. It is well, all the same, to bear in mind that the accumulation of these is all so much dead loss to the proprietor. At any rate they are a loading of the capital that is represented by the estate, and a consequent lessening of the interest derivable therefrom. For it cannot be said he draws rent from them. He may do so to a small extent indirectly. They are let as part and parcel of the farm which they have been built to serve. But how often do their existence on the farm lead to an increase of offers for the latter on the part of would-be tenants—at least to anything at all approaching their annual value? Even in the case where the farm tenant undertakes to pay interest on the cost of cottages for labourers, he rarely does so to the full extent of the outlay. Should this happen, they are likely, we are afraid, to be bare places of abode. There is generally a good deal to do to the building when the mason, the carpenter, the slater, and the plasterer have left. Moreover, the business has been arranged on the footing of probable cost. And that assumption, for various reasons, almost always comes short of the actual.

It is but just, of course, that the heavier part of the burden should be borne by the proprietor. But when he happens to be weak-kneed, to ask him to shoulder it all is hardly fair. He nearly always takes it up of his own accord when he has the power, and, fortunately for those whom it concerns, generally manifests an interest in it as he carries it along. We are not all strong alike, however. Nor are all proprietors equally well off. Some are able to face the question we are discussing in the light of an interesting pastime, while others are so placed that by themselves they are powerless to deal with it if ever so willing.

The Board of Agriculture is ready to authorise the advancement of money for cottage-building on entailed estates, and owners in fee-simple can act similarly with regard to their own properties; but this is not the most economical way of going about the business of providing accommodation for labourers. Over and above the price of the buildings themselves, there are various kinds of fees to be faced. What with preliminary expenses, inspection, and so on, these soon mount up to no inconsiderable sum on the cost of one or two labourers' houses. There is nothing wrong in this. Work done has to be paid for, and Government must watch against any misspending of its

money advanced for certain purposes. But what is the use of going to this extra expense if it can be avoided? There is no getting clear of it, however, where money has to be borrowed. Nor is this the only drawback to seeking assistance in that quarter. Government, as we have just remarked, very naturally enacts how the money is to be expended. Hard-and-fast lines are necessarily laid down which prevents any adaptability to varying circumstances. And materials of a quality which in many cases is too good for the surroundings is stipulated for. All this tends to hamper the business, as well as add to the expense involved therein.

But borrowers no more than beggars can expect to be choosers, and the inevitable must be faced if the money has to be asked for. Some tenants rather than want accommodation of the kind erect houses at their own expense, having first arranged for compensation at the close of their occupancy. This, we need hardly say, is not of frequent occurrence. It is not one to be encouraged either. At any rate, it is not a proceeding that one can call compatible with the customary methods of estate management in Scotland.

Our business is not at present, however, the finding of money for the erection of farm cottages. It lies in pointing out to those who, having the wherewithal but not much more to build, and consequently a free hand in that respect, are in search of information and the lines to take as regards economy and utility. We write, in fact, for those who are restricted to the erection of cottages on which the minimum of outlay, consistent of course with regard to the comfort of the occupants, has to be observed. Those who have not far to look for ways and means are, as we have said, in good hands already—at least in so far as style of house and room therein go. But their architects, who almost without exception are townsmen, can hardly be expected to be very familiar either with the household habits of the farm-worker or the climatic conditions that bear upon him and his habitation, and the sensible among them may be glad of a hint on these matters from some one who has ample opportunity of keeping in touch with the countryman. There are certain principles underlying the apparently simple business of country cottage-building which, if overlooked, spoil the comfort of the abode as a home, no matter how superior it may be in other respects, and our aim at present is to make these plain, so that the farm-labourer may have a greater degree of comfort in his house than in the majority of cases at present falls to his lot.

The Modern Cottage not so comfortable as the old type.

It is undeniable that most of the modern farm cottages are far less comfortable than those they superseded. The "auld clay biggin," with its thick walls of stone and mud and its deep cover of thatch, was warm within in winter and cool in summer. There were exceptions, due to a bad selection of site or to neglect in attending to repairs. But taken as a whole, they were superior in these respects to their successors. If the windows were close sealed and prevented the entrance of air thereby, they did not clatter all night long when the wind blew hard. Inside the thick shells of the old "buts an' bens" the inmates could sleep through a gale unconcernedly. And in the long forenights they could gather cosily round the fire and spend their leisure hours regardless of wind and weather. When the wind stormed and shrieked its loudest the sound thereof was considerably deadened ere it penetrated to the interior; and draughts did not much affect the occupants.

Very different, however, are many of the later cottages we see throughout the country. These are fitted with sash windows which have become slack in their hangings and leaky on account of neglect. Some rain and much air gain entrance by these when a storm comes their way. And the noise they make when shaken by the wind is a source of annoyance at any time, but at night is occasionally a serious cause of distraction. The tiller of the soil is proverbially a sound sleeper; but although he is seldom on the sick-list, illness sometimes overtakes his wife and children. And surely sitting in comfort at the fireside of one of these cottages that has been badly finished is entirely out of the question. Under ordinary conditions of winter weather the draughts that course chimneywards from door and window are death-dealing to the weakling, and when the wind blows and the rain beats upon the house it affords but a meagre shelter. At no time can we look on it in the light of a setting for the re-enactment of the "Cottar's Saturday Night."

More than likely the interior surface of the walls of such a house are plastered without the intervention of laths between the coat of plaster and the wall. The sleeping-places or so-called bedrooms may be lathed, but it is ten chances to one if the kitchen is. It matters not that the partition or division walls of the house are so dealt with. In fact it would be superfluous and a waste of money to lath them. But no part of the walls, one side of which is in contact with the outer air of a house that is to be occupied as a dwelling, should be allowed to go without a covering of lath before the plasterer coats the interior. When this precaution is omitted the house can never be complete of its kind. We except, of course, the case of

houses built with hollow walls, to which we intend referring a little farther on.

It may be pardonable, in order to cut down expense, to leave the kitchen walls unlathed, but to do the same by the sleeping-places is, we maintain, entirely unjustifiable. The kitchen is never for long without a fire on the hearth. In the other places the exception is to see one. It is not every room that is supplied with a fireplace; and it is not always that this is of service when it happens to be there. The grate is too often a mockery; and the chimney at times is unable to cope with the smoke. In the kitchen the heat from the fire counteracts to a considerable extent the dampness that is inherent in the outer walls that are plastered on the bare surface within; but in the other apartments, where lath has been denied those walls, we can hardly expect them to be dry. The outer face of a wall exposed to the weather we are familiar with is oftener damp than dry, and more or less of this dampness is bound to be absorbed in the thickness of the structure. It stands to reason, therefore, that where the inner surface of a wall so exposed forms part of a room, that part of it cannot escape being damp. And dampness in the walls of a room means its being cold, and, what is worse, its being favourable to the development of fungoid growths and of disease germs of a certain class.

The interior of such a wall as we are discussing may, when broken into, appear to the eye to be dry. And indeed, so long as the room is kept thoroughly aired and fired it may give little or no indication of the presence of dampness. The conditions of the kitchen, as we have hinted, generally keep it in abeyance. But in the bedrooms, comparatively unused to airing and firing as these are, the dampness of the parts of the wall we refer to is not long in leaving its mark. In spring and summer it disappears almost; but in autumn and winter the patches of mould spread and the paper loses hold of the wall. Even in the kitchen the parts farthest from the influence of the fire often show the same unsatisfactory symptoms.

But when we lath the walls we insulate, as it were, the interior surface of the wall from the outer side. We have then, so to speak, an inner shell within the walls of the building—attached to it, but yet completely separate so far as contact with the damp atmosphere is concerned. And besides serving to hold the room clear of the damp wall, the space between the coat of plaster and the laths acts as a non-conductor of heat, on the one hand keeping in check the cold that pertains to the wall, and on the other conserving the warmth within the lath-and-plaster casing of the room.

The inner walls, we repeat, have not much need of being lathed, no part of them being in contact with the outer air.

Where they join into the side walls there they are of course a little in touch with the exterior, but when the side walls are good and no rain leaks in, dampness rarely shows at the junctions of the two. But not infrequently the inner walls show dampness, due to their connection with the subsoil. They absorb damp therefrom, and give evidence of the same for some feet above the floor level. Lathing would cover this over. The proper thing to do in this case, however, is to go to the seat of the matter and prevent the ground-damp from rising in the body of the wall. A damp-course, such as we shall afterwards describe, does this effectually. This is better than covering the sore out of sight. The dampness that is inherent in the outer wall we cannot hinder, and have to guard against by means of lathing; but the dampness that arises from the walls, outer as well as inner, on account of their being in immediate contact with the earth, is easily preventable, and need not be glossed over by similar means.

The old-fashioned cottages we have spoken of seemed to be less affected by damp in either of these directions than the newer ones are, and they were neither lathed nor were they provided with damp-courses. The thickness of their outer walls would, no doubt, be a check against the penetration of damp to the inner surface. What can pass with comparative ease through the thinner walls we construct might have lost a good deal of its effect before it could penetrate the thicker ones that characterised the hamlet of old. And as for damp-courses in these, the nature of their foundation, which usually consisted of big boulders laid on the surface, was a considerable safeguard against the rising of ground-damp. All the same, plenty of these old cottages were without doubt damp enough. Still the majority of them were both drier and far more comfortable than most of those that do service nowadays.

The Essentials of a good Farm Cottage.

But coming to the point, let us see what the leading essentials of a suitable farm cottage are. To begin with, the cottage should have three apartments of some kind or other—a kitchen and two bedrooms. The limit of the house is often a room and kitchen. But most people will allow that another room, or at least a bed-closet, is necessary for decency's sake, if not for the reason of making home more attractive to the occupier. If there is but the one room allowed, it means the presence of two beds in the kitchen. There is no harm in this so long as it is open for the old folk to occupy one of the beds and the youngest of the children the other. In fact, this is the universal arrangement in the households which are free to act thus,

But where grown-up members of the family are obliged, on account of scarcity of room, to occupy the other bed, this is not very conducive to the separation of sexes or to the grading of individuals in accordance with their years that is called for in the interests of morality. It is absolutely necessary that one of the bedrooms has a fireplace therein. It is better to have one in each, but this is not always practicable where economy has to be strictly observed. It is essential in one of the rooms in cases of illness. In both, the respective fireplaces serve to promote the circulation of air, and generally to make matters within more wholesome. Though under ordinary conditions fire may be rarely in the grate, the vent keeps open passage between the air of the room and the outside.

It is but right, we think, that a scullery of some sort should be annexed to the kitchen. This keeps the kitchen freer of mess. The scullery need not be large; but it must contain a good strong sink in which dishes can be washed up, and potatoes, &c, be made ready for the pot. Together with this there should be room for the stowing away of pots and pans and suchlike furnishings of the house. The most of that which in reality finds a resting-place beneath the kitchen-bed should have space for storage in the scullery. There must, however, be no inducement held out to the conversion of the scullery into a wash-house. The place for the latter is clear of the house somewhere, otherwise the rooms will be affected by the moisture that follows the operations of washing-day.

A coal-house is a necessary adjunct of the cottage, and is the handier the nearer it is to the kitchen. We place it, as will be observed on the plan to be exemplified later on, quite near to the scullery and in touch with the kitchen. These two places, by erecting them as a lean-to at the back of the house, take up little space and do not show as excrescences on the cottage. Whether the cottage be of stone or of brick, the latter material is the proper one for the erection of the coal-house and scullery as we are planning them. It lessens the space they cover and saves roofing. The inner surface of the walls of these places require, we need hardly say, no lathing—they require no plastering, indeed. All that is needed to finish off the inner face of the walls of each is a smooth pointing of the joints in the brickwork.

Material for the Walls of the Cottage.

The selection of the material for the walls of the cottage will depend largely, no doubt, on the nature and situation of the district in which it is about to be erected. Where stone of a suitable description is easily obtainable, it will be the one made

use of. It is not often that we find brickyards and quarries of building-stone in close proximity. In the clayey districts where brickmaking is practicable, the rock generally lies too deep underground to be within reach of the quarryman. On the other hand, where the various strata are thinly covered there are seldom any beds of the right sort of clay to suit the brick-maker to be met with. Scotland's framework is but thinly covered—the larger part, indeed, standing out in its naked grandeur—hence brick-clay has had little chance of accumulating within her bounds. But if she lacks in surface brick-clay, her seams of coal are accompanied by thick sheets of fire-clay, out of which, when mixed with a due proportion of dross of some kind, a cheap and serviceable “composition” brick is forthcoming. It is only over our coal-fields, therefore, that bricks to any amount are manufactured.

Even, however, in stony districts, stones fitted for the erection of dwelling-houses are not always to be had for the lifting. In some boulder-strewn tracts they are, but there, we suspect, cottages are not in great demand. Such material as these afford answers well enough for houses after the type we have just been contrasting with the more modern farm cottage, but are not so well adapted to the thinner shell of the latter. But to bring more suitable stone from a distance to places of this nature may imply so great a cost in carriage as to be prohibitory. There the best must be made of the material at hand, and men brought up to handle material of that kind can turn it to account in a surprising manner.

Elsewhere stone—at least stone that is worthy of mortar—has to be quarried. Where this process increases the price of stone building to something like that of brickwork, we would never for a moment think of having recourse to stone. We are speaking, be it remembered, in a utilitarian sense, and have to keep economy before effect. Stone in nearly every case makes a more presentable house than the kind of bricks we in Scotland have to content ourselves with. But stone walls take longer to build, and generally they are not so easily made capable of resistance against the penetrative power of wind-driven rain.

Rubble Walls.

We would, we are afraid, be held as going out of our way were we to enter pretty fully into the subject of rubble-building, and point out the many precautions that require to be taken in order to make satisfactory work of it. There are one or two we cannot pass over, however, for on these depend greatly the weather-proof qualities of the wall. If, for instance, care be not taken with regard to the proper bedding of

the stones, the joints are only with difficulty kept water-tight. A stone set up on edge instead of being laid flatwise is very often a trap for rain. The stones used in rubble-work are, by reason of their having little or no squaring or other dressing bestowed on them, seldom other than angular in shape. It follows, therefore, that when we bed the angular stone with its longer plane vertical, or to put it simpler, if we erect it on its smallest base, it is in a worse position than if laid with this plane horizontal or resting on its largest base or side. Its base may be sufficiently broad either way to suit its own purposes so far as equilibrium goes, but it will play the part of a wedge, or rather that of an inclined plane, to the stones that bear upon it more so when in the former position than in the latter. In both positions its under bed will stretch a fair distance into the wall, but in neither will its contact with the stone above it stretch very far in. Water is likelier to penetrate at the top joint of such a stone than by way of its bed or under joint. And should wet once get over the shoulder of the stone its road to the heart of the wall is assured.

We are making the most of this, perhaps, because the acute angles are certain to be chipped by hammer off a stone of the shape instanced if it is to be selected for the outside face of a building. But as the object in keeping the long plane erect is to push ahead, and so get quickly on with the exterior face of the wall (for the fewer joints it shows the sooner it will be completed), very often too little of the point is removed to ensure a proper joint with the stone that comes to be bedded upon it. Unless the stones which form the outer face of the wall extend into the bed of the same far enough on every side, the building is badly fortified against the assaults of rain. For 3 or 4 inches at least adjoining stones should be in contact on edges and sides; not immediately in contact, but with mortar between in order to bind all together. But the angular stone, if dealt with in the careless manner we have referred to, does not bind itself to this arrangement; neither does the thin flat stone if set on end or edge—it is a worse subject, in fact. The angular stone may, as we have said, have a sufficient base, though it be wrong at the upper bed; but the flat one, if not thicker than the solid joint should extend into the wall, will not only be defective at the top bed, but at the sides and bottom as well.

The use of bricks sets aside these risks which accompany rubble-building. In brickwork every joint, both horizontal and vertical, is bound to extend at right angles into the wall between solid faces for at least $4\frac{1}{2}$ inches, which is the standard breadth of each brick. The exterior of a wall of this sort when well put together with good mortar, offers, it is easy to understand, a stouter resistance to the entrance of rain than one

where the joints are of such irregular as well as scant depth as may easily creep in, even inadvertently, to rubble-work. The rain with brickwork to face has to be driven in $4\frac{1}{2}$ inches before it can reach the interior joints. But that will soon occur in an exposed situation unless both material and workmanship in connection with the same are of a good class. If the joints be rather wide and the mortar poor the interior of the wall will soon be soaked. Where, however, good hands have been at work, and the mortar has set firm and the joints have outwardly been properly pointed with suitable material, the wall will be able to stand without harm all the vicissitudes of our trying climate.

When the body of the wall happens to be well packed defective jointing of the exterior face is counteracted to a certain extent. But when the heart of the building is loosely put together, wind has easy access through the mass and water goes with it. Solid packing of the wall keeps the wind in check, and rain has then less chance of penetrating far. But solid packing of the wall implies time and a liberal application of mortar, both of which mean more outlay on the part of the builder. The latter is too apt to trust to the after-pointing of the joints in the face of the wall to make it water-tight. It is surely better, however, to have the wall solid all through than merely veneered, as it were, for an inch or two in depth on the face, the remainder being left full of interstices. In the former case, even should the pointing go wrong, very little harm may result. In the other, once the pointing ceases to be a protection, the wall is incapable of hindering rain that is driven against it from gaining entrance to its interior. And as many of us know, pointing is at times very easily put out of order. The thickness and solidity of the walls of the old cottages we referred to above, as being drier than many of those of more recent erection, had no doubt, as we have said, much to do with that desirable condition. Situation, too, must often have helped to that end. Judging from the position of the ruins of many of these buildings, they were placed out of reach of the wettest winds. If set facing the direction whence these spring from, there was nearly always some obstacle in front of them that took the sting out of the blast before it struck.

We do not wish to imply that rubble-built farm cottages are never satisfactory in regard to the condition of their walls. The bigger number are as good in this respect as town houses built of rubble-masonry. But town houses have seldom to face what detached houses in country districts are accustomed to. When the stone is good for the purpose, and due care is taken in the packing and filling of the walls to make each as solid as possible, matters come out all right. On the other hand, flaws

may creep in through inadvertence; and the conditions that make for good work are not always in combination.

Concrete Walls.

Portland-cement concrete was at one time strongly advocated for the erection of farm cottages, but it seems never to have gained a footing. In it we have a material capable of making an absolutely solid and water-tight wall. And there is nothing, so far as we can judge, to prevent its being turned to account in this way in districts where gravel and sharp sand are abundant. When, however, these have to be brought from a distance, the preparation of the concrete would then become too expensive to warrant its use. It might pay to break whin and its allies into fragments fine enough for the purpose, if good sand were available to mix therewith, the stones hardly being sufficient by themselves to incorporate with the cement. Without the sand the wall might be a little less solid. But with sand in the mixture there would be small chance of cavities occurring in the body of the wall. The ideal base for the cement in concrete to be used in building cottage walls is, we consider, a mixture consisting of rough sand and fine gravel, the particles varying in size from that of a turnip-seed to the bulk of a bean. Not infrequently are seams met with that contain the two ready mixed by nature. With such at hand first-rate concrete for building may be prepared cheaper than stones and mortar can be made ready.

There are, of course, many difficulties in the way of turning out an efficient concrete wall suitable to the requirements of a dwelling-place, even when the materials are good of their kind. Few men are to be found with the necessary experience, and one does not like the idea of work of the kind being muddled. Concrete is exceedingly intractable after it has set—that is to say, concrete such as we would expect to find doing duty in wall-building. Without very exact frames and moulds the general outline will be irregular, and, what is even more serious, so will the openings both of doorways and windows. This is a serious fault, because it prevents close fitting of doors and windows. In fact, it would never do to leave the work of building concrete houses to men who had no previous experience of the business. There are firms who lay themselves out to perform work of the kind, and it would be wise of those who are within reach of good concrete-forming material, and are about to build, to consult with one of those firms before anything is done. The latter possess the special plant that is required in this line, and experience has taught them how the work is to be gone about in order to secure satisfactory results.

Brick Walls.

In some exceptional districts it is indisputable that concrete walls may be erected cheaper than either stone or brick ones can. In many more brick can be turned to more profitable account than stone. Where stone is at all difficult to get, or, if handy, where it happens to be of a middling quality, we would never for a minute hesitate in recommending brick for the erection of the farm cottage; neither would we at any place where the one was about as convenient as the other to be procured. Brick admits of a thinner wall than stone, and this means a little economy in roofing material. At first thought this, after what we have said above with regard to the thickness of the wall being an advantage in the way of comfort within the building, may seem contradictory. But we would build the brick wall with a hollow space as in fig. 1, which at once gives it all the advantages that can be claimed for the thick and solid wall. The hollow cuts off the weather-exposed part of the wall from the inner portion. Any rain that manages to force its way through the former can get no farther than the open space. It cannot touch the inner bricks, but must trickle down the inner face of the outer portion. All damp absorbed from the atmosphere is in like manner kept from affecting the inner bricks. What amount thereof is dissipated into the space within the wall cannot have anything like the effect upon the inner bricks that weather has on the outer rows. Actively aggressive wet, in the form of storm-impelled rain, can never gain access to the inner set of bricks; nor can a gentle shower. All in the form of moisture that can affect them is the vapour that the outer row may set free in the hollow part of the structure—much the same as happens in the space between the wall and the lath and plaster of the ordinarily constructed house. One would think that very little water could be evaporated from the outer bricks into this space. That dampness penetrates all through the brick wall which is in touch with the outer air is too easily proved, however. And a damp surface is very ready to part with its moisture, or, which is the truer way to put it, water is constantly evaporating into space. But it is evident that the two portions of the wall are on very distinct footings in respect of subjection to damp, the inner one being comparable, as we have seen, to the ordinary sheet of lath and plaster.

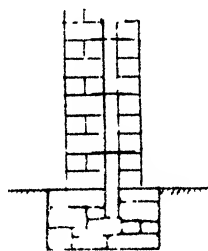


Fig. 1.—Brick wall - hollow space in centre.

The separate portions of the wall require, of course, to be tied

together, otherwise we have on our hands two parallel walls, one barely strong enough and the other not nearly so if built to the thickness mentioned below. But tied together at suitable intervals, say, with stretchers from one to the other built in 3 feet apart both horizontally and vertically, but zigzag wise, we have a single wall almost as strong as one of the same gross breadth they occupy built solid. Experience has taught builders that to tie the two parts of the wall together with brick or stone means bringing the inner part of the hollow wall in contact to some extent with the outer air. The ends of the ties reveal their position as so many damp spots on the plaster when this is laid on without the intervention of laths, thus demonstrating what we have been repeating about the dampness that bears upon the exterior of the walls of houses being more or less passed through to the inner surfaces. The degree of thickness of a wall is no doubt a governing influence in this respect. Conditions being similar, more is likely to find a way through a thin than a thick one. But then there is, as we have already said, a limit beyond which it is impracticable to proceed with regard to the thickness of the wall. Twenty-one inches is the standard thickness for rubble-built walls, while 9 and 14 inches are common sizes as regards that of brick walls. The wall we recommend for cottage building is one composed of an outer row of bricks 9 inches thick and an inner one $4\frac{1}{2}$ thick, with a space $2\frac{1}{2}$ inches wide between the two. This gives a wall 16 inches thick in all. We have seen a $4\frac{1}{2}$ -inch wall set to do service as the outer half of the erection, but this we consider an unwise policy.

In order that the inner wall may be completely insulated in the matter of damp from the outer one, it is necessary, therefore, that the two be bound together by some other bond of union

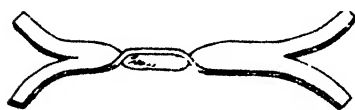


Fig. 2.—*Tie for brick wall.*

than either brick or stone. Galvanised wrought-iron ties, such as represented in fig. 2, are chosen for the purpose. The divided ends are bedded into each wall amongst the mortar as the two rise in common level.

When the mortar sets and binds the bricks into a solid mass, it holds the ties also firmly in its grip, the weight of the superincumbent bricks helping too in the way of keeping them firm. It is evident that no dampness in the outer wall can be communicated therefrom to the inner one by way of these ties. When tied by brick or stone it can be passed on, as we have seen, from one to the other. Either is more or less, according to quality, of an absorbent nature, and so unable to hinder moisture from penetrating all through its mass, and likewise affecting other absorbent materials that it happens to

come in contact with. But the iron tie is non-absorbent, and refuses to lead moisture from the one wall to the other. Nor can moisture that may condense on the inner surface of the outer wall and trickle down the same find its way along a tie that comes in its road. The double twist that is shown in the centre of the tie effectually prevents this. If the water gets that length it is thereby diverted to the under side of the tie, whence it must drop.

But here, as with everything else, care must be taken to perform the work effectually, else much of the benefit we are striving after will be lost. If a careless workman slabbers the mortar about in such a manner that large quantities of it falls into the space as the walls are being carried up, it will accumulate at the bottom, and thereby bring the two parts of the wall in contact, what we are trying all the time to avoid. And the ties, moreover, will become loaded with it, and their efficiency in the direction pointed out very much interfered with. Some mortar is of course bound to fall into the cavity even at the hand of the skilled and conscientious tradesman; but this may be counteracted by carrying the space down into the foundation a little way. This will permit any mortar that falls between the walls to find a resting-place without causing harm in the manner indicated. Unless gross carelessness prevails there will never be so much let out of hand as will fill the underground space to danger-point. The latter comes in above the line of the damp-course when we approach the floor-level. At every point above floor-level, where the two walls are brought in contact through the medium of stone, brick, or mortar, the wall may as well have been built solid. Mortar may, it is true, lodge, as suggested, on the ties, and thus to some extent interfere with their insulative properties in the connections we are referring to, but where it does gain a lodgment it is quite possible to reach far down by means of a rod and remove it. But the exercise of a little care in removing any that falls upon the ties before they get out of reach of the hand will leave very little to be done afterwards in this respect.

Damp-Course.

The damp-course is for the purpose of insulating the wall from the dampness in the ground in same manner as the space in the interior of the wall is meant to cut off the inner part from the dampness contained in the atmosphere. Where it is omitted there will moisture be absorbed at the foundation and passed up by capillary attraction into the body of the wall. The more absorbent the material made use of in the wall, and the damper the site, the damper as a sequence will the walls be.

But the damp-course, if effectual, keeps the ground-damp at bay. A continuous course of any waterproof substance meets the end in view. Portland cement answers well enough, only should the walls settle unevenly, which properly they ought not to do, the bedding of cement will crack. Asphalt is better, being equally water-tight, and decidedly more accommodating to circumstances. Sheets of felt and even prepared paper are now to be had for forming damp-courses. There is no excuse, therefore, through lack of materials, for neglecting this most important detail in house-building.

The position of the damp-course is a little above where the walls clear the ground. Where earth touches the wall at any point above the damp-course, the part of the wall so affected might almost as well have been built without the intervention of a damp-course. It is clear, therefore, that it is entirely impermissible to build against a bank. The soil must be thoroughly clear of the house all round. Should high ground be at the back or at the end of the cottage, there must be several feet of free space left there between the ground and the wall, as much at anyrate as will allow at least two feet of level ground below the line of the damp-course, as ruled by the formation of the ground in front.

No Laths required on the Hollow Wall.

With the double wall thus rendered proof against both the dampness of the atmosphere and the dampness inherent in the ground, plaster may be applied directly to the inner surfaces without the intervention of straps and laths. Lathing, as we have been so often repeating, is for the purpose of shutting off the exposed wall from the interior of the house; and so, we have been endeavouring to make plain, is the effect of the hollow in the double wall. The latter method seems, indeed, to be the more effective, because the space between the outer and inner bricks is greater than that between the wall and the laths. Lathing costs as much as plastering, therefore it implies a saving in outlay where it can be dispensed with. In certain cases there need be no plaster applied to the walls at all. If well-formed pressed bricks be used for the inner part of the wall, there is no necessity whatever for covering them up under a coat of plaster. When carefully pointed they make a much neater wall-surface than the flat unmeaning coat of plaster does. It is open, of course, to having paper on the latter, but the bricks can be tinted to form as pleasing an effect as arises from the wall-paper likely to be turned to account in the farm-labourer's cottage. Indeed if a warm-coloured good red brick is available no tinting of the walls is needed.

Should it, however, be decided to plaster the walls, it is advisable to apply some stronger material than ordinary lime plaster to the walls of the kitchen for the first 4 feet or so all round above floor-level. Chairs and tables pushed against ordinary plaster scratch it and knock holes in it. But a harder material prevents this. There are cement plasters manufactured which set so firm as to defy ill-usage of this kind, and the extra cost of one or other is, we consider, well-spent money. For our part, we consider a dado of thin lining attached to the portion of the wall in question the most effective protection. If 3½ feet high it will do. Suitable pieces of wood for the attachment thereto of the lining can be built on this part of the brick wall in the course of its construction. A poorer class of brick can be used where the lining is to be applied—that is, of course, provided the remainder of the wall-surface is to be left free of plaster.

Rough-cast.

Externally the wall may either be pointed or be finished off with rough-cast. To make certain that the first process will be satisfactory, the bricks must be of a good class, and the pointing material be likewise. Ordinary lime mortar is hardly good enough. Arden lime is preferable, but better still is Portland cement, mixed with sharp clean sand in equal proportions. Rough-cast such as we are now accustomed to is, we consider, a much better finish either to rubble-work or brickwork than pointing, no matter how well done the latter is. The rough-cast forms a continuous and impervious skin over the face of the wall. It not only makes the joints safe, but it makes sure that neither stones nor bricks that may be defective can pass rain into the interior.

Until Portland cement became common lime was used in rough-casting; but it is not lasting enough for the purpose, and frequently comes off in patches, thus leaving the wall so dealt with in a very poor condition to offer resistance to weather. This cement, however, affords us a rough-casting material that copes with our climate as stoutly as either stone or brick of the best description. We can use a second-class brick or even a third-class one in company with rough-cast,—not a class of brick, however, that is defective in cohesive qualities. It must not be inferred that we are advocating insufficiently burned and crumbly bricks for the wall. We merely wish to make plain that a brick of opener texture than will answer for exposure to the atmosphere does if protected by rough-cast. A pressed brick is required in the former position, while a looser compacted one will do well enough in the other. In fact it does better, for the rough-cast clings closer to it than to its fellow with the harder

and smoother exterior. For the same reason, rubble-work built of a poorish class of stone takes more kindly to rough-cast than does that of the best description.

In rough-casting a wall a thin layer of plaster, composed of cement and sand in something like equal proportions, is first smeared over the surface. Before this has had time to set—shortly after it has been applied, indeed—the rough-cast proper is applied. It is composed of tiny gravel or granite or whin chips and cement, also in about equal proportions, well mixed together, and is dashed from a peculiarly shaped trowel against the layer of cement and sand already referred to. Care has to be taken that before applying the rough-cast the wall is comparatively dry. The process must on no account be gone about in frosty weather; else disappointment will be felt over the job. If the immediate effects of frost are still in the wall, or if frost is able to affect the rough-cast before it sets, it will fail to take a proper hold of the building.

A good coat of cement plaster without the sequel of the rough-cast answers the purpose in view—that of rendering the face of the wall water-tight—even better than the rough-cast. It does not look so well, however, and a thicker coat is needed, therefore it is no saving over the double process.

Corners, Rybats, &c.

When brick is elected to form the basis of the fabric of the walls it is quite competent to dispense with stone corners, rybats, and lintels. These have to be hewn, whether for rubble or for brick erections when complementary to these, consequently it is a considerable saving if they can be done without. It gives the cottage a much improved appearance if a better class of bricks are made use of for corners, and are left standing clear of the rough-cast; those forming the rybats and lintels of the doorway and windows being similarly dealt with. Special bricks are manufactured for the purpose. Terra-cotta ones make a nice set-off to the rough-cast. The window-sills have almost of necessity to be of stone. Unlike the lintels, they must be jointless. The rain runs off the lintel (the joints therein lie away from the attack of rain), but it drops upon and runs over the sill, and were there seams in the latter it would not be water-tight. It has therefore been found expedient to form the sill of stone, and thereby escape the risk of defective joints in a pieced affair of the kind. Bricks are to be had that will admit of either a flat arch or a straight lintel being formed over the door and window openings. For our present purpose, however, it may be as well to use the single-piece stone lintel. It is, of course, quite practicable, if considered advisable, to use the same

kind of bricks for corners, rybats, and lintels as in the remainder of the walls, keeping them flush with the others, and covering the whole with the rough-cast.

Windows.

The windows constitute a detail which ought, we consider, to receive a little more attention. Very few men seem to have any idea what a comparatively complicated piece of work our ordinary description of window is. What with the frame, sill, sashes, astragals, meeting-rails, parting-heads, side battens, pulleys, weights, and so on, that go to make it up, it always appears to us as being hardly simple enough for application to the farm-labourer's cottage. There are so many parts in the apparatus that it is difficult to keep in order. Even when due attention is bestowed on windows they readily get out of repair. If not regularly painted decay soon sets in. Little wonder, therefore, that those which are never attended to last only a short time. There are so many joinings about them that when the original protective paint has lost its effect rain soon has them at its mercy. The putty falls off, and the glass becomes loose and admits rain; and at the different parts where moisture can lodge the wood ere long rots away. The sashes in time become loose in their bearings, no matter how well the wood has been seasoned to begin with. If unseasoned, they may begin to rattle on the first occasion of dry weather setting in.

This class of window can with proper attention be made to perform its end effectually without ever becoming a nuisance. It will, however, receive little or none in the majority of the dwellings we are at present concerned with, and therefore is completely out of place in that connection. The windows of the farm-labourer's cottage seldom receives a coat of paint other than it got when new. And once the cords that sustain the sash and its balancing-weights have snapped it gets leave to remain so. The space between the sole of the window-frame and the stone sill upon which it sits is allowed to become leaky, after which the bottom part of the frame slowly becomes a victim to decay.

Such treatment of the window is certainly not altogether universal. Some farmers look better after the cottages that are included in their holdings. They are a small minority, however. In the greater number of cases, unless the proprietor takes the affair in hand, the tenant lets matters drift. The cottage doors receive no better attention, but being simpler in construction than the windows, they are less vulnerable to the attacks of weather.

It seems a little strange that we in Scotland have never taken

a leaf out of the book of our English brothers and adopted casement windows for use in farm cottages. They are far simpler than those we have just been referring to. The opening part of the window is hinged, and all weights and pulleys and the other complications that follow the sliding arrangement of the sashes are therefore dispensed with. All rattling is avoided; and if well made to begin with it can hardly go out of order. In order, however, that rain be kept from gaining an entrance thereby, it is necessary that the casement be made to open outwards. This is not always so convenient for window-cleaning. But in the single-storey cottage one can easily reach from a chair placed on the ground to the highest part of the window. If the window is made to open inwards it is almost impossible,

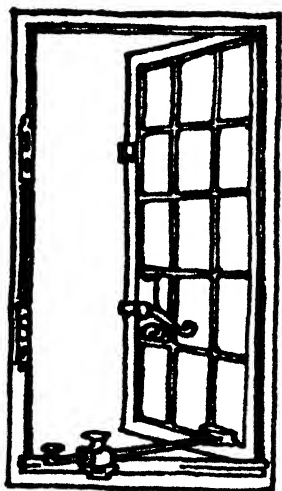


Fig. 3 — Iron casement window.

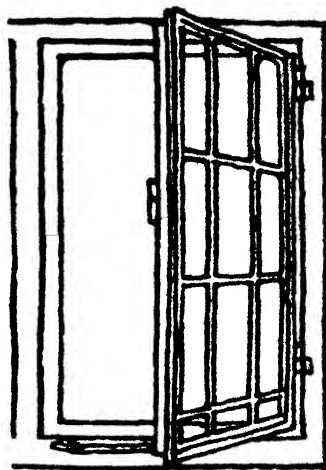


Fig. 4. — Iron casement window with wooden frame.

in exposed situations, to prevent storm-driven rain from getting in. Contrivances are to be had for obviating this drawback to the inward opening casement, but these are too expensive for application to the labourer's cottage.

Most of the casement windows we came across on our side of the Border are of wood; but there are now neat iron casement windows beginning to appear in the market, and we fail to see why these should not be taken advantage of in the kind of cottage-building we are discussing. Their cost compares favourably with the same class of window made of wood, and they are infinitely more durable. They are jointless, therefore rain finds no weak points in their armour. They have no flat sills underneath, which water undermines and can remain there setting

up decomposition. And although they might in time succumb to the effects of rusting, they suffer far less from being left without paint than those constructed of wood do. Fig. 3 represents an iron casement window something after the kind we mean as being suitable to the requirements of the farm cottage. Fig. 4 shows another casement window, the casement being of iron and the frame of wood.

Doors.

With regard to the doors there is little room for suggestions as to their simplification. They are simple enough already in all conscience. There is one point, however, wherein the outer door may be made more effective. Instead of being arranged to open inwards they, like the casement just referred to, should be made to open outwards. Whenever the outer door that is hinged to move inwards is exposed to the blast it is all but impossible to hinder wind and rain from entering underneath. There must be some space between the bottom of the door and the step to prevent friction between the two. But this space, which is usually an inch or two to start with, gradually enlarges. The step wears and the bottom of the door decays, and in these ways the wind in time gets freer and freer inlet. We have seen an extreme case where the cat could come and go at will under the door. If the door be made to open outwards, however, and is so adjusted as to fit close against the step which coincides with the floor-level, and the bottom be an inch or two below the top of the step, rain at all events can never gain entrance when the door is closed. Neither can wind to anything like the same extent it can in the former instance. It has first to get up behind the door and the step. In the other case it has an open space inviting its attention. When it becomes too riotous a sack or mat has to be pushed against the opening. But no impediment of the sort is ever needed where the door closes against the step in the manner we indicate. The harder indeed the wind blows upon it the closer it lies against the step, and there is the less space for the draught to pass in.

A simple little porch, if properly applied, makes sure, of course, that no rain can be driven underneath the outer door, and if for no other reason ought not to be denied the cottage which has a door of the ordinary sort. It need not have a door to itself. So long as it will keep the main doorway dry it serves a most useful purpose. In many cases the doorless porch will serve also to break the force of the wind that would otherwise have full effect upon the threshold. But notwithstanding the presence of this erection, we would still have the door to be con-

structed as we suggest. And should the porch even be provided with a door, either the latter or the main one, whichever was the more convenient, we would have made to act in the same way.

Floors.

Portland-cement concrete makes the best floor for the kitchen. Its hardness goes far towards resistance against wear and tear, and its smoothness makes it easy to clean. Flags and tiles are neither of them so lasting as concrete. Careless occupiers think nothing of splitting up the stake or rail that lent itself to removal from the fence, on the kitchen floor. Flag and tile soon succumb to treatment of this kind. In fact, unless each is of a high class of its kind, it very soon feels the effects of ordinary wear—the more so indeed at the hands of the better housekeeper, at least the one who washes her floor the oftener. The oftener common flooring material of this description is wetted the quicker it will begin to disintegrate; and once decay sets in the floors become irregular on the surface, and thus gives extra work and much inconvenience to the occupants of the house. Many a floor we can point to over which much care has to be exercised in the placing of the table and chairs thereon at meal-times. A stranger to the family circle, or at any rate one unacquainted with the physiography of the floor, when invited to “sit in” among the others around the table, is a little apt, under the circumstances, to cause an upsetting influence as he takes his place. And either the sweeping or the washing of a floor out of condition in this way is a most disheartening affair.

But the application of concrete as the floor-laying material puts an end to these inconveniences and annoyances. It is hard enough, as we have said, to resist any stick-splitting force that the farm-labourer's wife is likely to put forth. Water will never help to break it up; and shoe leather, with or without tacks driven therein, will not abrade it appreciably. It will maintain its original level, therefore chairs and table will at all times have a uniform bearing upon it. And being without joint or seam, it can be swept most effectually and washed with ease. And the more both brush and cloth are applied the higher the polish will it take on.

It is cold, no doubt, to the bare feet of she or he who has first to be up in the morning and set the fire agoing. But the same applies to the other materials. That, however, is not our affair, coming as it does within the scope of domestic arrangements. It is true, indeed, we encourage the old folks to sleep in the kitchen; but it fails us to afford them an apartment which combines the requirements and comforts of the cottage kitchen with those pertaining to the bedroom. If they suffer in their feet,

therefore, in the manner indicated, they must invest in slippers as a simple preventive.

Concrete is equally suitable to form the floors of all the other portions of the house, with the exception of the bedrooms. In lobby, scullery, coal-house, and similar places, it is the best material that can be utilised.

It is too cold a material, however, for the floor of the bedroom proper. Here it is essential to have the floor of wood. But the wood floor must be kept completely out of contact with the ground. The joists or sleepers that carry the flooring boards require to be laid on small walls either of brick or stone, built sufficiently close together to give ample support to the sleepers. These sleeper walls, or dwarf walls as they are sometimes termed, need be no higher than will keep the sleepers up to their proper level, and far enough above the subsoil to admit of the free circulation of air between the ground and the under side of the floor, protected openings being left in the side walls to promote draughts in this space. The tops of these sleeper walls should be finished off with the material that is used to form the damp-course already referred to, and have a board or wallplate bedded therein for the purpose of affording a sound and level bearing to the sleeper joists.

A small thin skirting board or base is fixed up round the foot of the walls of the bedroom in order to form a proper sort of junction between floor and wall. In fact, an arrangement of the same, but of cement, should not be grudged as a finish to the concrete floor wherever the junction between floor and wall is visible and within reach. It makes a good margin against which the washing-cloth can be applied without a slackening of pith.

The Roof.

As regards the roof, there is nothing we need draw particular attention to except perhaps the necessity of guarding against damp gaining admittance to the gable-heads. When this occurs it is very detrimental to the wall as well as objectional to the occupiers of the house. If it gets an entrance, even in a comparatively small quantity, it will soon work mischief. Not only will it cause disintegration of the mortar of the wall (for constant wetting, after it has once set, has this effect on ordinary lime mortar), but it will also affect the plaster on the interior face, whether it be in conjunction with lath or alone. If the plaster is spread directly upon the wall it will of course give indication of the evil at once. It will not be long, however, in telling its tale, even where laths intervene between it and the wall. The wet state of the parts of the wall that are thus affected will react on the straps to which the laths are attached, and they in

turn on the laths and plaster. What is sufficient protection against the normal or natural dampness of an efficient wall, as already referred to, can hardly be expected to cope with the aggravated conditions of one into the heart of which rain is more or less free to trickle from above.

The usual method of finishing off these gable-heads or skews, as we term them, is with hewn stones, as shown in fig. 5. The slates butt close against the sides of these, the junction between the two being rendered water-tight by means either of lead or cement. But either is very liable to misplacement in this position, with consequent leakage. Indeed, the skew stones themselves let water in. If the joints of the stones are not checked, as in fig. 6, which they rarely are—fig. 7 showing their common arrangement—rain ere long finds its way down through

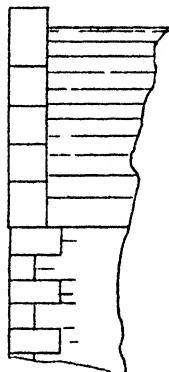


Fig 5.—Gable heads
—side view.

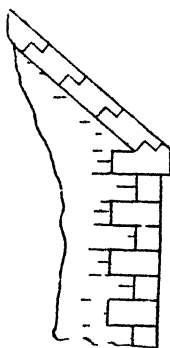


Fig 6.—Gable heads
method of check-
ing stones to keep
out damp

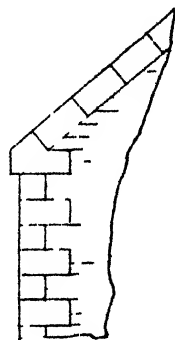


Fig 7.—Gable heads
—common arrange-
ment of skew stones.

these into the inner fabric of the wall. The majority of the stones in use are in fact incapable of altogether hindering water from penetrating through their own substance. They require of necessity to be of the nature of freestone, else the chisel will have little effect upon them, and most stone of this class is absorbent of water, which means that it cannot act the part of a water-tight covering in a very thorough manner. This can be obviated by bedding the stones on a continuous sheet or bed of cement. But there still remains the vulnerable part alongside the slates referred to.

We advise dispensing with skew-stones altogether, and as a substitute carrying the slates right over the wall-head. This can be done as in figs. 8 and 9, or as shown in figs. 10 and 11. The first method is the preferable one. It ensures thorough dryness in the parts of the walls we are discussing; but it

entails more expense than in the other instance. And a considerable amount of exposed woodwork being involved, with the consequent need of regular attention with the paint-brush, puts it out of court for the ordinary sort of cottage for the farm-labourer. We have, therefore, to content ourselves with the second method of rendering the gable-heads proof against rain without the intervention of skew-stones. As fig 10 shows, the

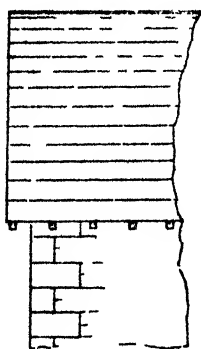


Fig 8

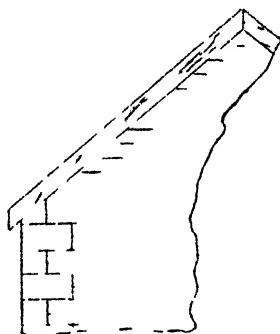


Fig 9.

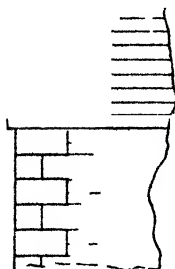


Fig 10

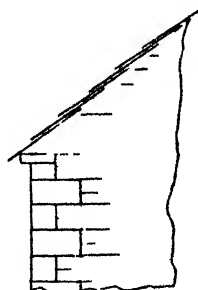


Fig 11

Figs 8, 9, 10, and 11 —Substitute for skew stones in gables

slates are made to project $1\frac{1}{2}$ inch or so over the outer face of the gable. It is impossible, therefore, so long as the slating is effective, that rain can gain access to the gable-top. None can penetrate the slate, as we know is quite possible, and indeed very frequent, where stone is concerned; and there is no such weak part as we find between the slates and the skew when the latter is in position.

As commonly applied under this arrangement, the sarking

or roofing boards are hardly carried far enough on to the gable to enable the slater to make a firm job of the edge. The slates are in consequence apt to shift a little, and the pointing up of the angle between them and the outer face of the wall to loose hold. A better plan is to finish off the gable-top as indicated

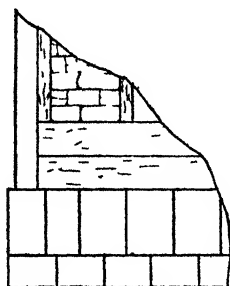


Fig. 12.



Fig. 13.

Figs. 12 and 13. -Showing how gable tops should be finished off for the slates.

in figs. 12 and 13. The boards, it will be seen, are carried well over the breadth of the wall, which gives every opportunity of obtaining a good foothold for the slates. And from where the ends of the boards reach to the outside face of the gable we have levelled up to the thickness of the boards with cement as the slater proceeds. Thus the slates are afforded a smooth and

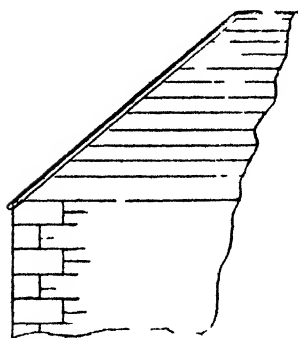


Fig. 14.

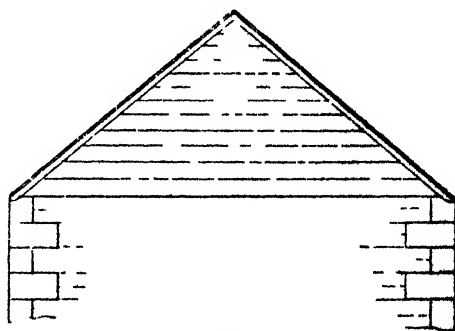


Fig. 15

Figs. 14 and 15 -Showing how gables may be dispensed with

sound bed, as well as one upon which they can easily be made fast. Under fair treatment this part of the roof, if finished in the way we suggest, is not at all liable to go out of order; and it is capable of at all times keeping the gable-tops thoroughly out of harm's way through rain. Figs. 14 and 15 represent

another method of dealing with the gables—simply dispensing with them altogether. It is perhaps the best of all. Very little more roofing material is required. There is more waste of material and more labour implied and extra rones and ridging for the “piends,” but no gable has to be erected, and the end walls are as dry as the sides. It is hardly adapted, however, to the elevation of the cottage we give in fig. 18 if to stand alone. As the dotted lines show, it would, on account of the position of the chimneys, look a little unsymmetrical if applied to the single cottage. But where doubled, or where more than two were together, this arrangement could be profitably applied.

The chimney-heads, where these part company with the roof, are likewise often left vulnerable to weather attack. But this at the exercise of a little care can easily be avoided. Lead is of course the best material to apply here. Cement, however, is in many cases quite good enough for the purpose of rendering water-tight the joints between the chimney-head and the slates. At anyrate there is no excuse for allowing rain to find entrance to the house thereby.

Why devote so much attention to these petty preliminary matters? some of our readers will no doubt be asking by this time, if indeed they have followed us so far. We are writing, however, for those who wish for knowledge in such matters and are not above profiting by the experience of others. It is attention to these seemingly minor and trifling details that make for comfort in the dwelling-house, as any one who has had special experience in such matters, and cares for the welfare of the working classes, if asked, will take the trouble to tell. Attention to them is called for in the town; but it is much more essential in the country. In the latter situation weather is virtually unchecked, and wind and rain when unloosed run riot around the solitary cottage. In the town one house shelters the other from the blast. Some winds never get fair on to the house within the town, while others are deflected overhead without coming to bear upon it at all. Even those on the outskirts of the town are exposed but at one or two points. But the country cottage, as a rule, is open to attack from all points of the compass, and if not weather-proof to begin with, it comes short of the first essential of its office—that of a complete shelter from wind and rain. If, however, this can be attained by observing the simple rules we have touched on, the little trouble that is involved therein is surely well spent.

The Accommodation and Arrangement of the Cottage.

Now that we have cleared the ground in these matters, and are free to follow the building operations generally, let us see

Fig. 16. *Ground plan of cottage of three rooms.*

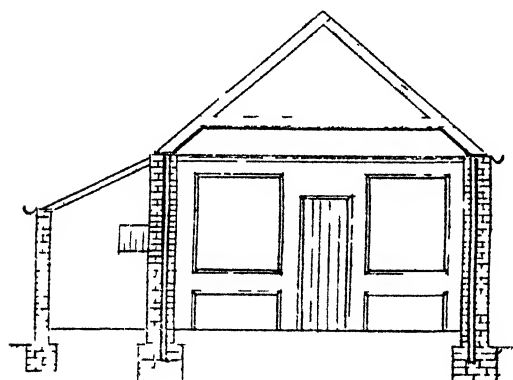
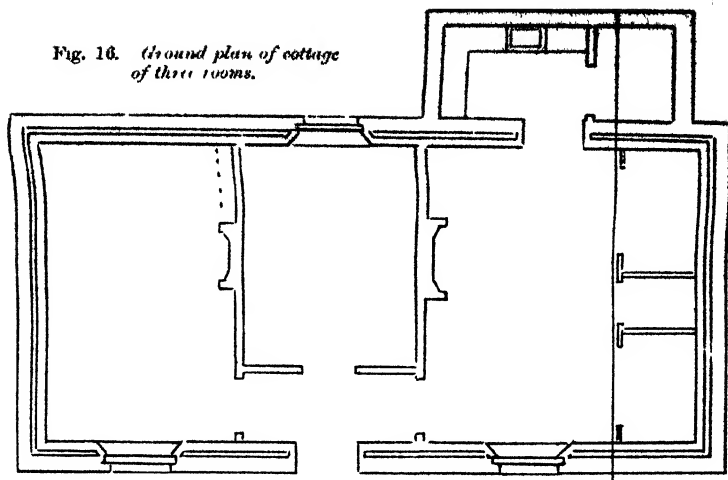


Fig. 17. *Section of cottage showing hollow space in walls.*

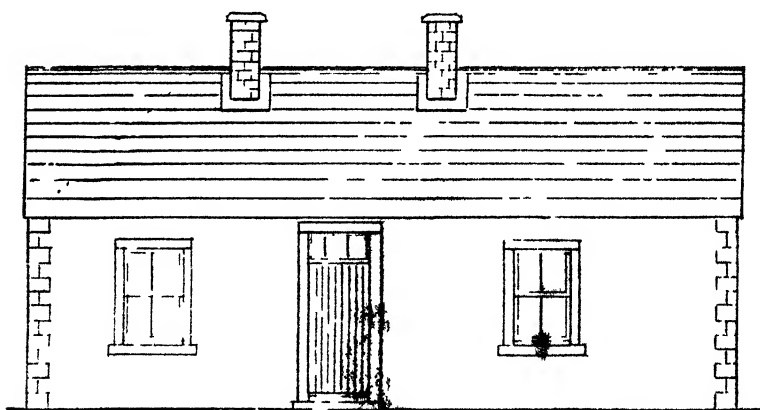


Fig. 18. *Plan of cottage - elevation*



first what accommodation can be spared to the occupier of the cottage. We have already spoken of three apartments as the minimum. A room and a kitchen would be ample were the family a small one; but small families are not in favour at the farm. There is not much casual assistance to be looked for from families that are small in number, therefore the farm cottage must not be too much scrimped. All the same, where many cottages are being erected at one place it will no doubt be good economy to have one or more of the room-and-kitchen type built. Newly-married young couples must make a start somewhere, and the small house suits them best. In addition to these three places we also pointed out the need there is for a scullery and coal-house being placed in touch of the kitchen. In fig. 16 we show a ground-plan giving the accommodation suggested, such as will do for us to give point to our remarks with. We hinted above that in Scotland the preference is to have the farm cottage built one storey high, perhaps on account of the rather stormy character of the climate; and we do not seek to depart from that custom. The "one-decker" can be made cosier than the one that is built with two—and at less cost, we consider.

The outer walls, it will be seen from the thicknesses thereof in the section given in fig. 17, are built of brick with a hollow space therein as previously described. The outer portion of the wall is formed of 9-inch brickwork, and the inner of 4½-inch. We prefer, where such is practicable, to keep the fireplaces against some of the partition walls within the house rather than in the gables or in the side-walls. When placed in any of the main walls much of the heat set free in the fireplace is lost on the outer side of the wall that is opposite the hearth and chimney. But if built somewhere within the area formed by the four walls—clear of the latter—none of the heat can be dissipated in this manner. The house gets the benefit of it all, excepting of course what escapes by way of the open chimney. In a row of cottages this becomes a matter of less moment. End on to each other one gets the heat that would otherwise radiate from the gable of the other if it stood alone. There is loss in the end too, however. It is as well, therefore, to make each self-dependent, and on that account able to stand alone as well as take up position in line with others. But whatever the number in the row, we incline to have them in detached pairs.

In the example given it is hardly practicable to have a fireplace in the centre room or closet. It is bound, however, to receive heat either from kitchen or end-room when a fire is lighted in one or other place, and from both when each fireplace is doing duty. The kitchen fire is seldom out. The other fireplace is not likely to be often put to account, but when a fire

does happen to be made therein the little room will receive double benefit. On account, therefore, of its position between the other two apartments, and the relation it holds with regard to the fireplaces they contain, the small room will not be liable to be much depreciated by the want of a fireplace to itself. The absence of a fireplace will be apt to interfere more with the ventilation than with the heating of the room. But due change of the air within the room might, if thought necessary, be provided for in some simple and effective method irrespective of the chimney-flue, which no doubt helps towards that end when present. A properly protected air-outlet can easily be obtained, and this fixed somewhere in the outer wall close up to the ceiling will serve to promote a movement outwards of the air in the room.

The arrangement of the rooms allows of a small lobby at the front door, affording entrance therefrom to all the apartments. The door of the centre room might be made even more convenient if taken directly from the kitchen instead of from the lobby. Some of the elder children would be likely to be accommodated here, and it would be better in touch with the kitchen were it made to communicate directly therewith. But, on the other hand, having several doors in one apartment makes the arrangement of furniture within an exceedingly awkward business. There are two doors already shown in the kitchen. The presence of another, with the window and fireplace in addition, would leave very little wall-space against which to arrange the various articles of furniture that require to be disposed of in this way.

The old folks, as we have hinted, are certain to fix on the kitchen as their sleeping-place, and one bed at least may be considered part of the furniture of that apartment. Oftener, however, as we remarked previously, we find two beds in the kitchen, and nearly always erected as fixtures. In the plan given we have not sought to discourage this custom, and have ranged the beds along the side of the room opposite to the fireplace. A fixed bed, such as we generally find in the Scottish farm-labourer's cottage, is at any time a less objectionable-looking addition to the kitchen furniture than the ordinary iron bedstead is. If beds are therefore to be placed in the kitchen, which they are sure to be, whether the proprietor takes them into account or not when the house is being built, we may as well provide that they will be adaptable to the taste and comfort of those for whom the cottage is being designed. In winter-time we often envy the comfort that is implied in the labourer's method of retiring to rest, and in his emergence from under the blankets to again take up the daily round. Not only is he able to strip under the comforting influence of the fire and

the pleasant temperature of the air in the room, and turn into bedclothes that are never chilly, but in the morning he takes to his feet to the cheery music of the crackling fire as the embers of yesterday's, never completely extinguished, are encouraged to attack fresh fuel. The arrangement may not be so sanitary as it is comfortable. It suits the labourer, however, and we do not wonder at it. We who faithfully observe the sanitary side of the question, sometimes in the dead of winter, when cold pinches, think to ourselves that we would be glad to let him take a little of it from us, and in exchange give us some of the comfort he derives from his domestic proceedings.

Six feet 3 inches is short enough measure for the length of the fixed bed. One of the two should at anyrate be this size in order to accommodate the heads of the family. Six feet may do for the other one. Thus, in accordance with the size of the kitchen given on plan, leaves 2 feet 9 inches of free space on the end-wall, which can be utilised for a wardrobe or closet. It is preferable to have this between the beds rather than having the two butting on each other and the closet at either corner. In fig. 17, the section already referred to, we have an elevation of how this side of the room is arranged. Some object to there being much woodwork in connection with the beds, and would ask to have the ends constructed of brickwork instead of boarding. Were we to do so in this instance there would be rather little space left for a closet between the two. The objection to wood lies in the danger it runs of becoming infested with vermin should a dirty family ever occupy the house. But we can, we think, safely leave this condition out of account. The frame of the bed and the recess it forms are finished off, it will be seen, with facing-boards beaded on edge. These give a finished appearance to the affair, and afford a basis of attachment to any chintz and fringe that the housewife thinks fit to adorn it with.

A common arrangement of the cottage used to be the one represented in fig. 19.

It shows a passage right through the house from front to back, the two doors being directly opposite. The back of the two beds did additional duty as one of the side-walls of the lobby or passage; and the space unoccupied by the beds lengthwise, which we, as

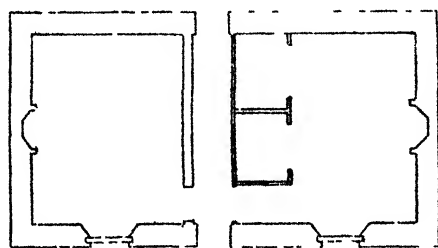


Fig 19 Plan of a "but an' ben" cottage.

above, have set apart as a small closet, served as entrance to the kitchen or the "ben" end of the house. On the other side

of the passage was another room similar in size to the kitchen. This formed the "but" end, a cottage of this description being familiar to all Scotsmen as a "but an' a ben." Sometimes a trap-door and ladder gave access from the lobby to some sort of loft overhead, hardly likely, however, to be of much account, though often put to use as a sleeping-place.

The door at the back, while handy to be sure, is bound to make such a house draughtier and colder than it would be were that exit built up. In the plan we suggest we dispense altogether with a back-door simply on that account. One leading out of the side of the scullery would be exceedingly convenient to the inmates of the house, but there are few situations where its discomfort in winter weather would not outweigh its general convenience. In these few instances, however, the back-door may unhesitatingly be granted. There are, of course, the ash-pit and privy and the wash-house as well to be given access to, which entails going round the gable of the house; but this can hardly be looked on in the light of a hardship. No matter how many cottages were in the row, we would never advocate the joining of more than two together; so in no case under this arrangement could the occupants have farther to go than the distance we have stated. Having to carry water in by the front door and through to the scullery would be, we consider, a greater drawback than having to go round the gable to the places just mentioned. But the water-supply is as apt to be towards the front as the back of the house. Were gravitation-water plentiful, we would almost be inclined to recommend its being led into the scullery in connection with the sink. This would be a great boon to the generality of housewives. Some would undoubtedly abuse the privilege. Still it is hard that the pains-taking ones should have to suffer by reason of their careless and improvident sisters. The instances are so few, however, where the granting of such a benefit could even be taken into consideration, that we need hardly here take up the matter.

There will be very little trouble, at anyrate, in getting fuel placed conveniently for the wants of the house. A small opening in one of the outer walls (the gable for preference) a few feet above the floor would allow the coal to be thrown into the coal-house from the outside. If thought a more convenient arrangement, the coal-house might change places with the scullery. A door would of course be necessary between the coal-house and scullery, as well as a similar protection to the outer opening into the coal-house. These, in addition to a door between the scullery and the kitchen, would cut off perceptible draughts from that side of the house. Roof-lights (cast-iron skylights) would be sufficient light-givers in both scullery and coal-house—an opening one in the former and a fixed one in the

latter. A window of any kind might be grudged the coal-house; but light is a confirmed enemy of dirt, and if for that reason alone should never be stinted.

Room is found for a cupboard or press at one side of the kitchen fireplace. Another might be fitted up at the opposite side, but in doing so there would be too little wall-space left for the disposal of furniture. We are afraid, as the plan stands, we afford no place for setting up the inevitable "dresser" or "aumry." It might be given a stance between the cupboard and the door opening into the scullery by shifting the latter a little nearer the bed, or, if it should there be apt to interfere with the scullery door, it might be made to occupy the place of the cupboard, the cupboard being shifted to the other side of the fireplace. Again, it might be so arranged that it could be placed at the side of the kitchen window next the fireplace. There need be no difficulty, at anyrate, in so arranging matters that a convenient place could be obtained for that useful piece of furniture, on which the thrifty wife likes so well to display her numerous jugs and other pieces of hardware. The cottage must be modified a little to the customs and requirements of any particular district. It is impossible to plan one that will fully apply to every case.

A glazed fireclay sink trough is a suitable thing of the kind to place in the scullery. The drain therefrom, we need hardly say, must be disconnected, so far as gases are concerned, with any underground channel, though still having free course to deliver water therein. This is easily attained by carrying the pipe that empties the trough directly through the wall and down outside near enough to the trapped grating to drop the water thereupon without coming into contact with it itself. If a trap after the description of a Hart trap (see figs. 20 and 21) is made use of as an inlet to the underground drain, the discharge-pipe of the sink may then be continued to pass a little way underneath the grating or cover of the trap. This arrangement should, in fact, be observed as well in the case of the rain-water pipes—the drop pipes or conductors that serve to lead down the water from the eaves-gutters—a matter, however, which we will refer to further on a little. We show a good broad shelf occupying the remainder of the side against which the sink is placed and also one of the ends. This might be of thick slate or flagstone. Wood in a place of this sort is apt ere long to become offensive. Where the keep of a cow happened to be a perquisite of the farm-labourer, 2 or 3 feet added to the length of the scullery would enable sufficient space to be partitioned off from the latter out of which to form a "milk-house." But the farm-labourer and the cow have now nearly everywhere parted company. So long, however, as enough milk to supply

the wants of his household is readily obtainable, it does not matter so much. With the conveniences such as are usually at command of the labourer's wife for the storing of milk and cream, she must, as present-day science tells us, be hopelessly handicapped in her efforts to turn the surplus of these commodities to profitable account in the market.

The mid-room or bed-closet speaks for itself. There are but the door and window, floor, walls, and ceiling, concerned in its constitution. In the absence of a fireplace we would fain have some other means of ventilation in the place than door and window, but under the circumstances which are likely to apply to it, such, though easy enough of contrivance, is here hardly practicable. Something after the nature of a mica flap ventilator would answer well. To ensure due ventilation of the space under the floor, it would be requisite to have a hit-and-miss grating built in, say, under the window in the outer wall, and on the opposite side a tile or pipe carried through the base of the concrete floor in the lobby and communicating with another opening of the same kind under the step, or wherever most convenient or of most effect. There might, if considered necessary, be two at the latter side of the house. A through draught would then be maintained beneath the floor, and the wood that made up the same thus be kept sound and fresh.

In the principal bedroom a grating at each side as in the little room would keep the floor in order; and further to promote the movement of air, which is as necessary, to keep wood so placed as on the under side of floors from premature decay, communication could be left between the respective spaces by leaving openings in the base of the brick partition that divides the two. The fireplace in this room makes for improved ventilation. It may not do much for carrying off the upper layer of air within the room, but it will keep the lower stratum on the move, and so help to maintain the air within the place in wholesome condition. But there is one point in connection with the vent that leads from this fireplace that will repay attention. A great deal of rain finds its way down a chimney. In one such as that under discussion, in the fireplace of which a fire is oftener absent than present, all the rain that comes down the vent cannot be vaporised and returned to the atmosphere before it has made itself felt on the fabric of the building. Care, therefore, should be taken to protect in some manner the open end of the vent, so that while the upward draught is not interfered with, and free exit is given to smoke, rain will be kept out. Deterioration is almost generally allowed to proceed from this cause—one by no means limited to the humble cottage.

We could make sure of there being comparatively pure air in this room, as of course we could in the mid one, as already

hinted, by inserting a flap ventilator in the wall close to the ceiling and communicating with the vent, if not with the outer air direct; but this, we consider, is hardly a justifiable proceeding in such a situation. What with the door and window and the chimney, the air of the room ought to be maintained fairly fresh—as fresh at anyrate as the inmates are likely to care about.

There is room for a cupboard in this room, as shown, between the fireplace and the back wall. A small mantel-shelf completes the fittings of the room.

With regard to the grates of the cottage, that in the kitchen need only be one of the simple open affairs which are familiar to us all. It should be deep enough to admit the “girdle,” and be provided with a “swey.” An oven at one side is a useful adjunct—not that the Scottish housewife, like her English sister, wants ever to bake a loaf therein, but it is a convenient place in which to keep food warm for the “guidman” when he happens to be late for a meal. Something strong and substantial is wanted—not one of the slim fragile affairs that are so often turned to account. And to make sure of the various bread-winners’ garments getting dried in rainy weather, it is well to see that a couple of hanging rails are fitted to the kitchen ceiling. These are remarkably useful on many washing days too. A suitable grate for the room is one of the class known as “shams.” A grate of this description consists of an iron front and fire-bars, the sides and back being built with fireclay bricks to any shape thought most suitable. Grates of this sort are generally better drawers than other kinds. Most country masons know the best way to build the back and sides with a view to smoke being led as easily as possible into the chimney.

The Chimneys.

A badly acting chimney is a deplorable drawback to the utility of any room, whether it be one of many or one of but two or three. The causes conducive to the retrograde action of chimneys are so numerous, and usually so obscure, that in many bad cases it is almost impossible, without going to extremes, to work a cure. What steps may serve to keep the air going in the right direction in one may even aggravate the bad state of another one, down which air can move as freely as it ought to be going upwards. In every properly acting chimney the current is necessarily almost always upwards. Whenever this happens to be checked or reversed when the fire is alight we know the consequence—the smoke comes into the room instead of issuing by the chimney-top. When the air goes as readily one way as the other the chimney is in a bad condition

indeed, and woe betide those who are obliged to occupy a room with a chimney of that nature.

If we carry a chimney high enough we reach a point where it cannot act otherwise than maintain a constant current upwards. The atmosphere lessens in density as we recede from the earth. It is more closely packed the nearer we approach the earth's centre. It is denser at the base of a long chimney than at the top, consequently the interior of the chimney acts as a communicating tube between the layers of different density or tightness of packing. The tighter packed air at the bottom of the chimney is not slow, therefore, to avail itself of the opportunity of getting more elbow-room in the freer space offered by the looser packed air at the top, and speedily makes its way upwards. We cannot, of course, lengthen our domestic chimneys beyond a certain extent. The longer we can make them, however, the better are we preparing them to act their part effectively.

But even chimneys of the length adapted to our ordinary houses, provided no adverse circumstance arises to interfere therewith, tend to lead the air upwards from the fireplace to the exit at top. The circumstances that tell against their efficiency are the position of the building they are part of in relation to surrounding objects, such as trees and other buildings, or higher ground (being at the edge of a cliff or at the head of a declivity may make the building a nuisance in this respect). Any of these are capable of bringing side issues to bear upon the chimney-top in so far as the wind affects it. So long as it can stand up fairly face to face, as it were, with the wind, all goes well; and the stronger the wind the better will be the result. But when any of the objects instanced divert the wind from its path in connection with the building, the wind applies its force to the chimney-head in an uncertain manner. It is this irregularity of action that brings out the weakness of a defective chimney. It tries the mettle of a good one; but the questionable one soon reveals its character when the wind one minute bears upon it as a gale, while the next moment it is the centre of any eddy due to objects that overlook it, and the smoke being driven back down the vent into the room.

The position of the fireplace as regards doors and passages has also often a good deal to do with the action of the chimney. So too, as we hinted above, has the manner of grate adopted and the construction of the fireplace. And there are other causes which sometimes pass the wit of the local chimney doctor to discover and ameliorate. The cottage chimney, being short, is on that account often the worst to deal with. It lies at the door of every one, therefore, who has to do with the erection of cottages of the farm-labourer to take every pains that the

chimneys will do their part in so far as his department is concerned. The builder cannot be held responsible for drawbacks due to the site of the house, nor for those that may arise from the plan he works from. The experienced inspector knows, however, the kind of vent up which the smoke can pass easiest, and should act accordingly.

Even where these necessary precautions have been taken, one is not sure that the chimney will perform its part. Not until it has been fairly tried can it be guaranteed to act properly. It is necessary to see to this after the house is in occupation and the chimneys have been subjected to trial in all sorts of weather. There is nothing, as we have indicated above, that militates so much against the comfort of the house as badly acting chimneys. A house suitable in other ways is rendered all but uninhabitable when it cannot thoroughly clear itself from the smoke that arises from its fireplaces. It is not quite so bad when a room vent is the one at fault, because there fire may be refrained from; but in the kitchen a fire is a daily necessity.

When the kitchen chimney is defective, the house, no matter how well arranged and otherwise adapted to the comfort of occupants, is truly a miserable one. Cottagers who complain on this head should have their wants attended to at once. Many a cottage there is where often the kitchen windows have to be opened when a fire is set agoing. This can be borne with if only necessary until the fire gets thoroughly kindled, as is the way with some vents; but when it becomes obligatory to continue this means of encouragement for days on end sometimes, grumbling on the part of the dwellers in the house is clearly justifiable. And in many others the room fireplaces are, as we have said, frauds, on account of their inability to discharge all the smoke at the upper end of the chimney. "'Deed, sir, I think they put the wrang end o' the lum uppermost, for a' the reek comes oot at the grate," replied a labourer's wife recently when asked why she did not light a fire occasionally in the room, which was giving indications of much damp about it.

To make matters worse, it often occurs that the room chimney, besides being unable to get rid of the smoke that falls to its share, actually passes down into the room smoke that issues from the kitchen vent alongside, thereby "adding insult to injury," as it were. It is a bad one, indeed, that acts in this manner. Chimneys of this sort are not difficult to find, however. As a rule, the career, whether for good or evil of such a one, is cut short by means of a bag of straw stuffed into the neck of the grate by the exasperated housewife. Back-smoke, such as that brought down gratuitously in this manner is called, is due to the down current in the defective vent carrying with it smoke from some adjoining one. But it sometimes happens with vents

that cannot be altogether described as defective, more especially where cottages are concerned. It can be prevented by keeping the exits at different levels—keeping the defective one lower than the one that is reeking regularly. If the room chimney can therefore be kept lower than the kitchen one, there is not much chance of the former, when inclined to contrariness, acting as receiver of the smoke set free from the other. When they are on one level, and the smoke from the kitchen vent is driven towards the room one ere the smoke has cleared the chimney-top, some of it is drawn down the latter should the current at the time become reversed; but when the kitchen one is higher the smoke at once gets beyond the reversing influence of the other and clear away into the surrounding atmosphere. Our plan, as the elevation in fig. 18 shows, has each chimney in a place by itself; not, however, as a preventive of the nuisance referred to, but just as it happened to work out. If we have laboured this matter of smoke it is not without cause, as many a poor family could tell had they the power or, at anyrate, the opportunity of doing so.

Eaves-gutters, &c.

We casually referred above to eaves-gutters, spouts, or rhones, as the collectors of rain along the eaves are variously termed, and to conductors or drop-pipes. No house should be without these. When they are wanting it is impossible that the base of the building can be kept dry. Not only the base (though it gets the worst of it) is thereby made damp, but nearly the whole face of the wall suffers from the roof-water being allowed to play freely thereupon. What drops clear to the ground splashes the wall a considerable way up, and what does not, wets more or less of the building accordingly as it is caught by the wind. The foundations of a house unfinished in this manner get no chance of becoming dry; and even when safeguarded with a damp-course, the wall above it is almost certain to be adversely affected by the frequent wettings it gets both from above and below. A rough-cast or cement-plastered wall will, we may say, suffer less in this way than a pointed one.

The cast-iron half-round rhone is very suitable, being comparatively cheap, easily put up, and durable; and round drop-pipes of the same material are its proper accompaniment. As we have suggested, the proper termination of the drop-pipe is under the grating of a Hart or other trap of similar principle. It is then in direct communication with the drain, and yet, as the Hart trap exemplified in fig. 20 shows, cut off from it as regards the gases that are apt to be generated therein. The

trap in this figure is made in one piece. In this form it is not so accommodating as in fig. 21, where it is in two pieces. When in two the inlet part can be turned to the position that best suits the wall, while the under part at same time is adapted to

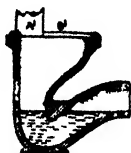


Fig. 20.

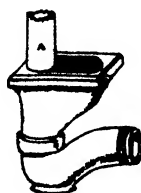


Fig. 21



Fig. 22.

Figs. 20, 21, and 22.—*Hart's drain-traps.*

fall in with the run of the drain. There are other traps, such as the one in fig. 22, which represents Burnett's rain-trap, equally suitable to the end in view. The drop-pipe finished off in this manner is able, it is easy to see, to deliver the roof-water without chance of its affecting either wall or foundation.

But all thrifty wives have a hankering after rain-water for use on washing day, and the sequel thereto is some improvised reservoir in the form of a barrel set up wherever convenient to a conductor. An affair of this sort is generally always, however, a source of dampness to the building it is supplementary to. When the proprietor fits one up to begin with, all may go well for a while; but left thereafter to the care of the occupier, the fittings are rarely renewed, and the barrel gradually becomes leaky, keeping everything in touch with it damp and unwholesome.

When the occupier is left to supply the water-collector as best he can matters are bad from the beginning. He or she can hardly be expected to erect an affair of this kind of any great degree of efficiency, because a proper appliance of this nature is expensive to start with, and it requires frequent attention in the way of repairs. Fittings wear out; frost may do much harm right off; and the plumber's bills mount up at a surprising rate. The best arrangement is to finish all the conductors in the manner indicated, and lead the water from the cottage or cottages directly to a tank close to the wash-house.

Drains.

This necessitates the separation of the rain-water drain from the one that leads away the sewerage. The day was, and not so long since either—in fact it lingers yet in many places—

when it was considered sufficient to throw the slops no farther from the house than could be reached from the doorstep. If proprietor and tenant are content with this primitive arrangement, no outsiders are likely to interfere so long as it applies to one or even a pair of cottages, but when more come to be grouped together the local authority will probably have amendments to suggest. It is but a poor home, however, that is so circumstanced that the waste liquid matters of the household are daily scattered around it. A bad drain is a greater evil, because it concentrates the mess and causes it to stagnate without the accompaniment of ample fresh air; this the stuff which is scattered on the ground gets abundance of, and is thereby rendered comparatively harmless. There is no need, however, for the drain, any more than other parts of the house, being defective.

The sink shown on the plan renders a drain imperative at the back of the house at least. If we are obliged, therefore, to have one there, it is not going very far out of the way to have one leading to the front as well. There being no back-door, certain of the slops are obliged to be taken through the front door to be emptied (we fear, all the same, that in many cases much will be despatched by way of the sink that ought to be taken frontwards). Where the back-door is existent there is no need then for a drain for slops towards the front; but should the roof-water not be diverted as suggested above, there is of necessity a drain required to carry it away clear of the site of the house. Any way we look at the matter almost, it is evident that in nearly every case a drain to lead away either rain-water or slops, or both together, falls to be provided for as part of the cottage at front as well as at back.

Land-draining tiles may be quite suitable in some situations and in some soils, but fireclay glazed socket pipes—spigot and faucet pipes as we best know them by—are in nearly every case the correct thing in this connection. The stuff the drain is there to lead away from the house may as well be left on the surface as run into one that leaks at every joint and saturates the soil around it with the contents before they have reached any distance. A retentive soil will of course have none of it, no matter how leaky the drain may be, and the liquid must make for the lower end of the channel, and in such a medium any sort of pipe is efficient. Pipes of any kind could, in fact, be dispensed with could we keep the passage clear without them. That we cannot do, however.

But drain tiles are quite effective under such circumstances. In freer soils we must fall back on the socket pipes, the class with which we are able to make water-tight drains. And with these, as we have said, it is necessary to lay the drain that is to

carry the rain-water to the tank, if such there is to be. Where it is not considered necessary, the rain-water has then to be consigned to the sewer drain—failing the water-barrel, of course. But the barrel cannot at times avail itself of all that is offered to it, neither can it, as a rule, on account of faulty condition, retain for long what it takes delivery of, and provision has to be made for this balance.

A good-sized gully or “jaw-box” is a necessity as part of the domestic drain referred to. A strong fireclay cesspool with a suitable grating, something like what we use at the sides of our streets, makes a good thing of the kind. This is not easily put out of order, and is capable of standing hard wear and tear. It holds a lot of sand or other sediment before the outlet becomes affected, which state of matters it readily reveals; and it is easily cleaned out. It is not necessary that there should be one for each cottage. One may be set to serve two or three, if there be many cottages together.

It may be necessary in some cases to more effectually cut connection between the cottage and the sewer drain, than the traps already referred to and the gully accomplish. The usual means of doing so is the Buchan trap, shown in figs. 23 and 24. Sewer gas cannot get past it, and air has free access into the

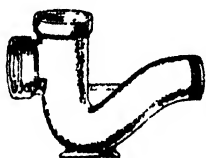


Fig. 23.

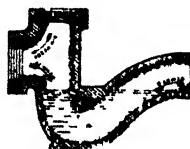


Fig. 24.

Figs. 23 and 24.—*Buchan drain traps.*

part of the drain that separates it from the upper end beside the house. In order to complete this arrangement, however, an open end needs to be left at the head of the drain. An iron pipe carried from the drain up the wall clear of the windows answers the end in view.

Over and above these drains it may be needful to have one set apart to keep the foundations of the house a little freer of ground-damp than they might otherwise be. Field pipes are what is required in this instance. We want to draw superfluous moisture from the soil this time. These pipes, laid end to end, with unprotected joints, enable this to be done. The joints are close enough to keep out soil, but not water. What water the soil cannot readily retain leaks into the drain, which, being laid with a good fall, runs it off to lower levels clear of the site of the house. If laid 9 inches or so below the level of the founda-

tions it ought to serve its purpose sufficiently. And if filled with broken stones nearly to the surface it will be all the more efficient.

We are degenerating into details again, we are afraid, but the observance of these latter rules we have laid down are as necessary towards securing a comfortable and a healthy house as those we discussed earlier. The cottage that is quick to let water in by the roof or slow to let smoke out by the chimney can be neither. Nor can one that is difficult to ventilate, or sits in the midst of soil that daily has the house slops thrown upon it, and during rain receives what falls from the roof.

The carrying out of the details we refer to means, as we have already said, little or no extra outlay beyond what falls to the credit of the ordinarily erected cottage. The most of it simply entails careful workmanship with an eye to its being adapted to the end in view, and not a mere clapping together of the various materials that take part in the erection. We want the roof put on with a view to its being water-tight, and the chimneys constructed with a view to their being effective. We are, unfortunately, as apt to have both carried on in the spirit of getting so many square yards of roofing and so many cubic yards of building erected in the shortest space of time. Competition is to blame for this, but it is the best system we have, and we must make the most of it. But the work we are concerned in at present is so simple in itself that only the hardened sinner will scamp the job.

The cottage we exemplify is of course but typical of its class. As it stands, however, it is capable of suiting many situations, and it can be modified to suit others. It has stood us as a text around which to heap up the teachings of everyday experience. And further, it shall serve us to assess the cost of a plain serviceable cottage—one that, while effective on the lines we have noted, is at same time as cheap as can be erected without the several tradesmen concerned therewith being losers by the job.

The Specification.

The specification of how the work of erecting the cottage is wished to be gone about would (without going very closely into technicalities) run something on the following lines :—

The foundation-tracks to be dug out until a solid and equal bearing throughout is obtained for the walls, sleeper-walls, and partitions. The soil within the area of the outer walls to be stripped off down to the firm subsoil. The whole of the material thus excavated to be removed to any place, afterwards to be pointed out, and there deposited in a tidy manner. (Where the ground chosen for the site is uneven, and a certain amount

of levelling is consequently necessitated, this must here be stipulated in similar terms.)

The outer walls to be founded up to surface level of ground with large stones, the interstices well packed with small stones, plenty of lime mortar being used in bedding and jointing the whole, and generally filling the track tight against both sides. In similar manner the partitions, sleeper-walls, and hearths are to be firmly founded. The foundations of outer walls to be 6 inches broader at each side than the thickness of its walls—the inner ledge being carried up to serve as a scarcement. Those of the partitions and dwarf walls to be proportionately broader than the thickness of the walls they are to carry. (Or if thought advisable, the foundations may all be of Portland-cement concrete.)

A damp-course to be laid all round the outer walls and be continued along the partition-walls, sleeper-walls, and under the hearths. This to be of asphalt, or of slates bedded in cement, and to be situated at the level, which quite clears the surface of the ground outside that has been left undisturbed.

The walls to be built of the thickness and to the arrangement shown on plan. The outer walls to be of good rough but well-shaped composition bricks. Those of the main building to be hollow, the outer part 9 inches thick, built with a clear amount of headers therein, and the inner part $4\frac{1}{2}$ inches thick. The space between the two portions to be $2\frac{1}{2}$ inches wide, the two being tied together with a plentiful amount of galvanised iron ties—no less than nine to the square yard. Properly made lime mortar, consisting of good limeshells and sharp clear sand in proportion something like one to two respectively, to be used throughout the building.

The house corners and the door and window rybats to be of the ordinary bricks made use of in the walls, and to be flush. The door and window lintels to be of the same but moulded to suit. The window-sills to be of polished freestone 4 feet 6 inches long, 8 inches deep, and 9 inches broad. (Either a nice red brick or polished freestone, or granite for that part, may be used for corners, rybats, sills, and lintels, built to stand clear of the rough-cast. Our elevation (fig. 18) shows them in freestone.) The door-steps to be of Arbroath flag or hard close-grained freestone.

The chimney-heads to be of pressed composition brick with a dressed freestone cope 5 inches thick, bevelled at upper edges, and projecting 3 inches all round; to be checked on top for inserting the base of a fireclay chimney-can, which is to be secured therein with cement.

The floor of kitchen, inclusive of hearth, the floor of the lobby, and the floors of scullery and coal-house, to be of well-

prepared Portland-cement concrete 4 inches thick laid on a thick coat of broken stones; and the bedroom hearth also to be of concrete.

The walls of scullery and coal-house to be of 9-inch brickwork of the same description as above; and the various partitions of $4\frac{1}{2}$ -inch brickwork, the latter being carried up clear of ceiling level.

The necessary sleeper-walls to be built for the wood floors of the bedrooms; and galvanised gratings, 9 inches by $4\frac{1}{2}$ inches, to be inserted in the outer walls to induce a circulation of air beneath these floors—two in the larger room, one at back and one at front; and say three in the smaller one, one at back and two at front, one of the latter at each side of doorstep communicating with room by means of 4-inch fireclay pipes laid below the concrete floor of passage.

A fireclay sink 24 inches by 15 inches, inside measurement, set on a solid brick foundation, to be erected in scullery, fitted with a proper outlet communicating with a Hart or similarly effective pipe over a suitable drain. And a polished slate slab or shelf 14 inches by $1\frac{1}{2}$ inch, set on iron supports, to be carried round the back wall and end of scullery as indicated on plan.

The chimney-heads to be pointed with cement. The exterior of the walls to be coated with rough-cast composed of best Portland cement and sand and fine gravel (or crushed granite), in proportion of something like one to two respectively. The walls of coal-house to be smoothly pointed inside with cement; those of the scullery to be plastered with cement $3\frac{1}{2}$ feet above floor-level, all above that to be smoothly pointed with cement as before.

The main roof to be framed, as shown on plan, with rafters and collars of 6-inch by 2-inch good white pine, securely fastened together, and set at 18-inch centres on 15-inch by $1\frac{1}{2}$ -inch wall-plate. The roof of "lean-to" to be of 5-inch by 2-inch rafters, at same distance apart, secured at head to an 8-inch by 2-inch runner fastened to back wall of house, and at foot resting on a 10-inch by $1\frac{1}{2}$ -inch wall-plate. (The wall-plates of roofs are broad enough to project sufficiently far beyond outer faces of walls to give tilt to the eaves slates.) The whole to be covered with $\frac{3}{4}$ -inch sarking-boards firmly nailed to the rafters (and carried on to the gables as shown in fig. 12). A ridge-batten and the necessary tilting fillets to be fitted up. The necessary safe lintels to be 1 inch thick for every foot of opening, and of sufficient breadth to fill their respective places. These and the wall-plates to be of red pine.

Iron casement windows, something after the style represented in figs. 3 and 4, to be fitted in (on the elevation we give in fig. 18 we show ordinary sash windows); and an opening roof-light,

30 inches by 16 inches, to be in scullery roof; and a dead one, 24 inches by 12 inches, to be in coal-house. A fan-light as shown plan to be over front door.

The door styles and lintels to be 6 inches by 2 inches, the outer set (together with transom of fan-light) of red pine and the remainder white pine. The outer door to be made of 3-inch by $1\frac{1}{2}$ -inch red pine flooring boards, held together by three 6-inch by 1-inch boards at back, and be hung with three strong butt hinges. (The door to be hung so that it will open outwards and close against a step at bottom, as recommended in the text.) The room doors to be of similar construction, but of selected white pine boards. The cupboard doors and the coal-house door to have styles and lintels $4\frac{1}{2}$ inches by $1\frac{1}{2}$ inch, and be of 1-inch boards. These and the room doors to be hung with bat-and-band hinges; all the doors to be fitted with approved fasteners and locks where necessary. The outer opening into coal-house to have a strong, close-fitting, red pine door, fitted thereon with proper hinges and slip-bolt. The cupboards to be lined inside with $\frac{1}{2}$ -inch lining boards, and each have four shelves of 1-inch boarding. The kitchen beds to be substantially framed—the partitions, front, and door between, of $\frac{7}{8}$ -inch lining on 3-inch by $1\frac{1}{2}$ -inch standards. A plain mantelpiece to be in room, and a mantel-shelf in kitchen. And two 12-foot rails hung with stout cord from pulleys screwed into the roof collars to be fixed up in kitchen for drying clothes.

The feet of the rafters and the under sides of the collars to be lathed in preparation for plaster.

The floor of each of the rooms to be laid with 3-inch by $1\frac{1}{2}$ -inch white pine tongued and grooved flooring-boards, nailed to 6-inch by 2-inch red pine sleeper-joists. The sleeper-walls and side scarcements to be laid with wall-plates $4\frac{1}{2}$ inches by 1 inch, bedded level on lime to give a bearing to the sleeper-joists. A 6-inch by $\frac{1}{2}$ -inch moulded skirting-board of selected white pine to be carried round each of the rooms; and facings of the same to be fitted to the door openings that require such. The necessary stops to be fixed to each.

The roofs previous to slating to be covered with inodorous felt carefully overlapped at the joinings; and the chimney-heads to be made water-tight with 6-lb. lead at the parts shown on plan. The slates (whatever the kind chosen) to have no less cover than $2\frac{1}{2}$ inches of lap to begin with at the eaves, and $1\frac{1}{2}$ inch at the finish, the difference being gradually reduced from start to finish; and to be fastened with galvanised wrought-iron or spelter nails. The eaves to be fitted with $4\frac{1}{2}$ -inch cast-iron beaded rhones resting on galvanised wrought-iron hooks nailed to sarking 3 feet apart and fastened thereto with copper wire. The rhones to be supplemented with $2\frac{1}{2}$ -inch drop-pipes

or conductors fastened to the wall with strong wrought-iron holdfasts and communicating with Hart or similar traps (as in figs. 20 to 22). The ridge to be finished off with zinc ridging of No. 12 zinc, 14 inches in breadth, fastened down on ridge-pole by means of galvanised wrought-iron clips put on 2 feet apart and firmly nailed to the ridge-pole.

The walls, with the after-mentioned exceptions, and the ceiling of kitchen, bedrooms, and lobby, to receive three coats of well-prepared lime plaster. The first and second coats to be composed of run lime and sharp clean sand—one to two—with a due amount of well-teased ox-hair mixed therein; and the third to be run of lime alone. The part of the kitchen wall excepted to have a dado $4\frac{1}{2}$ feet high of adamant cement put on all round where not occupied by the beds and recess between. (The plastering of the walls would of course be dispensed with were red pressed bricks used for the inner portion of the hollow wall and the partitions. On the other hand, were the cottage to be built of stone, not only would the outer walls need to be plastered, but in addition they would require to be previously lathed.)

It is hardly necessary for us to take note here of the construction of the various drains. A foundation drain might or might not be laid. At anyrate it would merely consist of a field drain covered to near the surface with broken stones. And the description of the sewer-drain, and more especially its length, depends altogether on the character of the site on which the cottage stands. But a 4-inch, or at the very outside a 6-inch, spigot-and-faucet glazed fireclay pipe drain, jointed water-

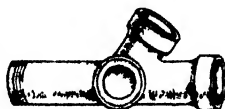


Fig. 25

Fig. 26.

Figs. 25 and 26.—*Inspection eyes in drains.*

tight with cement, is all that is required, together, however, with the necessary traps and inspection-eyes that make it complete. The latter, such as shown on figs. 25 and 26, are simply for the purpose of enabling one at any time to see how the drain is behaving. If the rain-water from the roof is to be conserved and led away separately, as suggested above, another water-tight socket drain is essential, but a 3-inch one is of ample size. If, however, it has simply to be got rid of, the one drain is sufficient for both.

Ash-pit, &c.

Hitherto we have said nothing with regard to providing an ash-pit for the cottage. There is not much in this, however. Neither is there in the erection of the necessary little building that usually accompanies the same. The two together are not a very costly affair. Somewhere at the foot of the garden is the proper site for these combined places. The lack of a back-door in our proposed cottage necessitates going round by the front when on a visit to either, but one is obliged to yield points now and again. Figs. 27, 28, and 29 represent the ground-plan and

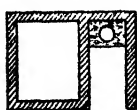


Fig. 27.

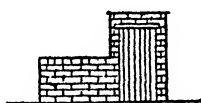


Fig. 28.

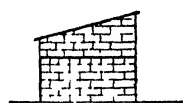


Fig. 29.

Figs. 27, 28, and 29.—*Ash-pit and ash-closet.*

elevations of a simple arrangement of the ash-pit and ash-closet, whereby the ashes do service in deodorising the noxious matters that proceed from the other. For our part we would as well have the two disconnected, though combined, and trust to the labourer seeing to the frequent emptying of the box or pail that has then to be provided. Less offensive matter can collect under this arrangement than when the two are worked together. A little sprinkling of ashes now and again in the pail goes a long way to hinder the existence of any nuisance in this connection. Covered ash-pits are now strongly advocated.

A wash-house is an almost essential addition to the offices of the cottage; but it may be simplicity itself—plain brick walls, a concrete floor, a copper, the roof either of wood and slate or galvanised iron, with an opening skylight therein. The occupier's wife should be allowed no excuse for undertaking the periodical wash in either the kitchen or the scullery. All the same, it is unfair to expect her to wash clothes in the open, as we sometimes see her doing alongside some wall where she had managed to improvise a copper out of a big pot and some loose stones. This may do well enough during good weather, but in winter and spring the seeds of disease are often sown in the constitution of the woman who is obliged to overtake her work under these circumstances. When two or three cottages are together the matter of wash-house accommodation is easier solved than in the case of the single cottage, for what serves one is quite capable of answering the demands of half-a-dozen or so, simply by each housewife taking the use of the place in

her turn. When the single cottage is in question the wash-house may, if thought advisable, be attached to the last two mentioned places in some way or other. When, however, there are several cottages built near to one another we can afford to make the wash-house a little larger.

Cost of Farm Cottage.

Coming now to the cost of such a cottage as we are exemplifying, erected to the specification given above, the different items work out, at present rates, to the following figures:—

Brick and mason work	£80	0	0
Carpenter and joiner work	52	0	0
Slater and plumber work	21	10	0
Lath and plaster work	10	0	0
	£163	10	0

After completion of the cottage there will be a little painting to do. Then there is the ash-pit with its accompaniment to be faced and the wash-house; and more or less making up of ground and the drains come further to swell the total. Say that we allow £16, 10s. for these 16 10 0

The cost of the cottage then amounts in round figures to . . . £180 0 0

For something like the sum quoted, then, it is practicable to erect a plain cottage suited to the wants of the Scottish farm-labourer—one which, moreover, is warranted to be as comfortable as convenient, and not at all likely to be found fault with by any fair-minded officer of health. The drains and outside offices the latter will perhaps be more exercised about. There are so many different ways of accomplishing these, dependent on the locality and site of the cottage, that each case almost has to be dealt with on its own merits. So long, however, as these plans are effective in their way, the simpler they are the better for the peace of mind of every one concerned.

We could exemplify others, for the one represented is capable of many modifications in arrangement as well as construction, but what would be the good? The one given serves well enough to bring home the principles involved in the subject, and unless these are observed the cottage, as we have so often remarked, no matter how commodious and elegant, can never afford a comfortable home to the occupant—and surely the farm-servant, if any one does, well deserves such a boon.

Note.—One or two of our county councils have already adopted bylaws in accordance with the Public Health Acts, whereby it is made compulsory on any one who contemplates building or altering a dwelling-house, previous to starting the work, to de-

posit plans and give particulars of what is proposed to be done. These bylaws lay down the lines to be observed in the arrangement and construction of the dwelling-houses that come within their scope. We are not aware whether any of the strictly agricultural counties have adopted such bylaws, but some of those that embrace mining districts have—Renfrew and Lanark, for instance. Miners congregate pretty closely, while farm-servants' houses are mostly apart, consequently among the former infringement of the laws of sanitation is quicker to tell its tale. But no matter what county we take, the principles we have been enunciating, while simple and easy of observance, are still sufficient to meet the demands of any bylaws of the nature we refer to.

MODERN CALF-REARING.

By ROBERT SHANKS, Woodend, Biggrigg, Cumberland.

AMONG the many agricultural topics discussed within the last few years, calf-rearing has taken a prominent place. The increased consumption of milk in our populous centres has developed dairying to an exceptional extent within the last twenty years. The increased acreage of permanent pasture provides a wider field for grazing stock. With these two factors constantly at work, one has not to look far before he can see that the demand for store and dairy stock has increased enormously. Along with this we have foreign cattle prohibited to enter this country for other than slaughtering purposes. This gives the home producer of live stock a monopoly, and thus calf-rearing is of ever-increasing importance. Although much has been written of late about calf-rearing, the actual feeding only has had full attention paid to it. What is equally essential to success is the care of the calf in respect to proper housing.

Housing.

Before proceeding further it will be the endeavour of the writer to outline what he considers the best method of housing calves till they are six months old. Of course the following system does not and cannot apply to calves reared naturally. If the cow before calving is a likely subject for milk fever (parturient apoplexy), she should be put into a loose-box to calve, and her offspring allowed to suck for four or five days. The dam will more thoroughly cleanse the calf than any human

hand, but if the calf is taken away immediately after being dropped, it should be well rubbed down upon a clean bed of straw.

Individual isolation is the initial desideratum of success in housing. Many rearers may say that that is impossible, as they have not the adequate buildings and facilities. I admit that much is advocated which it is impossible for the humble farmer to follow, however willing he may be, but this recommendation does not come under this category. A few favoured farmers have what are known as calf-pens in their buildings—small divisions suitable for one or more calves. The majority of us are not so favoured, so we must make the best of it by making a removable imitation; or, if the building is to be used exclusively for young calves, a permanent erection can be put up by any handy farmer. The removable imitation has its advantages over the fixed pens, in that the house or shed can be cleared and used for other purposes when not required for this particular class of stock.

Home-made Pens—their Construction.

Secure some lathlike strips of wood, 3 feet long, $2\frac{1}{2}$ inches broad, and $\frac{3}{4}$ inch thick. When these are nailed $2\frac{1}{2}$ inches apart with suitable nails in a perpendicular position to two parallel pieces of wood of suitable length to fix from side to side of shed, we have a handy portable foundation for calf-pens. The length of the principal span should not be above 18 feet, because even at this length it is a little unwieldy to handle. Of the many nooks and corners about farm-buildings it will seldom be necessary to secure a span greater than the above-named. What is wanted is a proper length to fix from wall to wall, and 18 feet is seldom exceeded one way of the building. If it is so, a stout post should be driven into the floor and used as a joining place to which the ends of the heck can be lashed. A post is set out 6 feet from each corner of the outshed, and either driven into the ground or fixed to the wall by staples. To these posts the heck of proper length can be fixed.

Each calf should be allotted at least 30 square feet of ground-space. If this area is adopted, and the principal heck is 6 feet from the wall, the division would come in 5 feet apart. These divisions are constructed and fixed in the same manner as the longer ones, only that the parallel sticks belonging to the shorter length are fixed to the uprights at such a distance apart and of such length as to allow the ends to slip between two of the laths of the principal heck. This is adequate for a fixture at one end, and the other can be tied to a post—such as that before described—against the wall.

An erection of this description is of sufficient stability for young calves. It will be seen that there is no entrance to the interior of the pens, but when once the calf is in and the whole arrangement fixed, there is little or no inconvenience, as it is easy for the attendants to feed and "bed" the calves over the top of the railings.

With the laths and the right-angled corners a pretty substantial fixture for the milk-pail can be made by merely slipping a piece of short railing across the corner, forming a triangle. Into this a bucket is slipped, and there is no fear of the calf capsizing its milk while attention is given to some of the others. The above description may be easily followed with the aid of the accompanying illustration (fig. 30).

Three months at the outside is long enough to confine calves individually—in fact two months is often considered sufficient. After this they will adapt themselves to their artificial surroundings, and when let loose amongst some others, will not

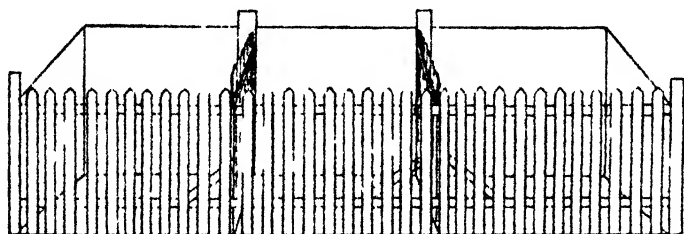


Fig. 30. *Temporary divisions for calves.*

attempt to suck each other. Thus hair-balls on the stomach, and kindred disorders brought about by this bad but natural practice, never trouble the rearer. A loose-box fitted up upon the lines described above can be made to hold as many calves separately as the same box would supply ample room for running together. The pens being easily removed, the area is converted into a loose-box again with little trouble or inconvenience. In a loose-box there should be about 36 square feet of floor-space for each calf.

Loose-Boxes.

When the calves have arrived at the age of from eight to twelve weeks they will have acquired a natural liking for good lea or meadow hay in no small quantities. A hay-rack of sufficient length to enable all of them to feed properly ought to be fitted in the box. This should be placed against one of the walls and fixed quite near to the ground, because if the bottom

of the rack is 2 or 3 feet above the floor—as is often the case—seeds and chaff from the fodder are more liable to drop into the eyes (fig. 31).

A wooden trough of the same length as the rack above described is always an essential in a loose-box for calves. This is to hold their roots, meal, or cake. A good height for the trough is to have the bottom 18 inches from the ground, and either fixed to the wall with staples or placed on pedestals the proper height (fig. 31).

Any one who has had experience in giving milk to calves that are three months old or more, knows what an unruly, rough lot they are when they see the milk-pail at feeding time. The difficulty of managing properly without scattering some of the milk is increased when we have to deal with half-a-dozen or so running loose. They all make frontal attacks on one

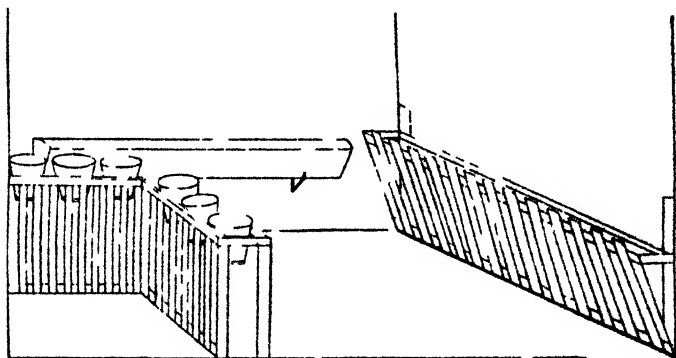


Fig 31 - *Loose-box fittings for calves.*

bucket. Patience to the animal mind is out of the question, especially when there is anything appetising to be had. After the attendants begin to rally and the calves' headlong career is checked by a sharp switch across the ears with a stick, they settle down to their respective pails. One of them, before it gets properly started, imagines that its neighbour is getting a more tasty mouthful, and soon there are two heads in one bucket. Another, when it has finished, gives its pail a punch and perhaps drives that vessel into sharp collision with the attendant's shin-bone. If we can dispense with some of these interesting incidents, so much the better.

In front of the door a right-angled double barrier can be stuck up, either fixed or movable, 18 inches high and the opening between the top spars 10 inches wide; this is of sufficient width to drop an ordinary pail into. This prevents the calves from rushing out at the door when opened; they are

kept at bay, as it were, until the milk-buckets are placed in this barrier. The pails are for the time being a fixture; the milk with ordinary care cannot be scattered by the punching calves. Although this erection (fig. 31) causes a little inconvenience to the attendant—he must step over it when foddering or bedding, &c.—yet on the whole it is a considerable improvement, as past experience has proved to me. When the ventilation is inadequate, as is often the case with loose-boxes on a farm, the door can be occasionally left open, and this barrier will prevent the calves from getting out.

Bedding.

As important as it is to keep calves from sucking one another (this is the sole object of the pen system), it is even more so to see that they get properly attended to in the way of bedding, and the houses systematically cleansed when the dung is removed periodically. For the first week there is nothing better than clean wheat-straw. The calf at this initial stage of its growth is not such an extravagant animal for bedding as it is later on in life. No hard-and-fast rule can be laid down as to the kind of material suitable for this, but if straw is not overplentiful a splendid substitute is found in powdered moss litter. It is supposed to have all the advantages of an ideal bedding with no disadvantages. Economy, durability, comfort, sanitation, safety from fire, and increased value of manure over straw-made dung, are all claimed for it. The litter should be powdered pretty finely; and all users have discovered the advantage of this, if the absorptive and deodorising powers are to be thoroughly utilised.

Absorptive Power of Moss Litter.

As a comfortable bed is of paramount importance to the young calf's wellbeing, it may not be out of place just to touch upon the respective qualities of the two beddings named. We are told that moss litter absorbs about nine times its original weight in liquid, while straw absorbs only about three times its own weight. With this data given it is a simple calculation. Weight for weight, moss litter will last three times as long as straw. Numerous tests have been made here with the former bedding, and the absorptive power was never found to be above six times its own weight, and even at this the litter was in much too wet a condition to be comfortable for the stock.

If there is ample straw, of whatever description, about the steading without purchasing, it is not advisable to fall back upon the manufactured article; but if the home-grown article is not equal to the demand, then no better substitute can be pur-

chased than moss litter. Weight for weight, for actual bedding purposes, straw will generally be found to be as economical as its rival. One reason for this may be that with straw some of the urine sinks through the bedding and runs away to the dung-heap or to the tank, as the arrangement may be. When a good litter of chaff, sawdust, or barn-floor sweepings is used as a foundation, this prevents any loss of urine when straw is used. It is always advisable to prevent as far as possible the liquid manure from leaving the shed, because even if it is caught by a tank properly constructed, the loss amounts to no small item. The principal and most valuable constituent, nitrogen, is largely lost. Urine as it leaves the animal possesses very much more manurial value than the solid excreta, as the following comparison shows:—

Analysis by Stockhardt of urine and solid excreta voided by the cow on winter diet.

	Solid excreta Per cent	Urine. Per cent.
Water	84	92
Nitrogen	3	8
Phosphoric acid	25	traces
Alkalies	1	1.4

These figures can only be taken approximately, as a great deal depends upon the age, diet, and physical constitution of the animal. If we can seize the liquid and "fix" the nitrogen at the same time by proper choice of bedding, this is a distinct economy. Moss litter can do this to a certain extent.

Analysis of stable manure by Dr. Bernard Dyer.

	1 ton moss litter Per cent	Wheat straw Per cent
Nitrogen	88	61
Equal to ammonia	107	74
Phosphoric acid	37	43
Potash	102	59

In spite of these advantages, however, moss litter can never entirely replace straw as a bedding on an arable farm. Under ordinary circumstances straw is produced in ample quantities both for fodder and bedding, and often it is of such low value in the market that it would not pay the farmer far from a railway to dispose of it and cart it away. Speaking generally, oat-straw has double the value as a food over its value as a manure; but in spite of this stock cannot eat an unlimited quantity, and the remainder must be used. It is only in a year of scarcity, when straw is short and dear, that moss litter will or can be used to any great extent on the arable farm.

Moss litter tends to keep down the objectionable smell so

often caused by young calves under cover, and in this respect scores another point over straw; but if the following system of mucking is followed, this point scored is wiped off the slate.

Mucking and Disinfecting.

The dung voided by the animals should be removed every fortnight. In the case of removable pens used the first ten weeks, these are taken out so that complete access is given to the workman. After all the dung is taken away, to keep the building sweet it is advisable to wash out the floors and wash the walls with a disinfectant. The little extra trouble and expense are amply repaid.

Dishorning.

I wish to touch upon a humane practice which is on the increase as time goes on. I allude to dishorning. The cruel practice of chopping the horns off when full grown is fast dying out, for we have it now in our power to check and entirely destroy the growth of the horn before the calf is a week old. This is done as soon as the bud of the horn is felt, by clipping off the hair surrounding the horn and rubbing the point of the bud with caustic potash, or a "chemical dishorner" which is largely sold north of the Border. The nucleus of the horn is moistened with saliva and rubbed with the composition until blood appears, and it is seldom necessary to apply a second dressing. If it is so, repeat the process in about a month or five weeks. It is painful at the time, as is known by the animal shaking its head, but no ill effects follow. I have never known a calf refuse its milk once through this cause alone—a pretty sure indication that the operation has little or no serious effect upon the system.

Isolation and Tuberculosis.

It has already been stated that individual isolation is essential, and the reasons were given. Complete isolation from the dams is also necessary if we wish to rear cattle free, or at least comparatively free, from tuberculosis. It has been proved by experiments over and over again, on the Continent, in America, and at home, that tuberculous dams seldom pass that "terrible scourge" on to their progeny. If the calves are kept in a different shed which has no direct communication with the cow-house, they may be fed with the mixed milk of the herd, even if there is a high percentage of tuberculous animals amongst the milk-producers, and yet the calves will thrive and keep clear of the disease.

This was driven home most forcibly to me when I first began to use tuberculin. None of the calving heifers as they came forward reacted, and they had never come in contact with the dams up till then. They continue to stand the test, and house isolation as much as possible is adhered to, although the whole pasture together during the summer months. Had the calves been in touch with their tuberculous dams, or even been housed in the same shed as yearlings and two year-olds, the tuberculin would have revealed a different state of affairs. It is a matter of great importance to know that with care a comparatively sound herd can be built up from a lot of tuberculous cows.

The Best Calving Season.

On a cheese-making farm the cows begin to calf in February and finish in May. This is to have the cows in the flush of milk when the best of the grass is on, and from which the best cheese is made. When there is sufficient grass, and the fine weather comes in, the calves are generally turned out. With the artificial feeding and sudden changes of hot and cold, wet and dry weather, the very young calves are prevented from thriving properly. The only way to overcome this is to keep them in the house.

The butter-maker generally has his cows calving the whole year round, and on this account he has a better chance of selecting and keeping calves dropped at the time of year he thinks most suitable.

The wholesale milk-seller, on the other hand, tries to arrange to have the majority of his cows calving when the winter price comes in, beginning with October. From a calf-rearer's point of view this is the best time of year—the best months to have calves coming forward being November, December, and January. When they are given fair treatment at this time of year, and kept going forward by judicious handling and feeding, we have a calf six months old ready to wean in June or July, and on a good pasture the young animals go right ahead, having reached an age when the variable climate has not such an adverse effect upon them as it would have if they were three or four months younger.

The advantages of summer grazing for calves—after they have reached the age of ~~six~~ months—are manifold. The careful attention, so necessary ~~when in the shed~~, is not required to the same extent, and the essentials ~~most~~ paramount to all classes of stock—fresh air and sunshine—they get in abundance.

Feeding.

There are still many who maintain that the natural way is the only desirable means to a profitable end. This may be appli-

cable under certain circumstances and with certain breeds of cattle. For instance, the Highland and Aberdeen-Angus, or other breeds that are notorious for their small average yield of milk, may be allowed to suckle their calves; but in the case of dairy Shorthorns, Ayrshires, and other breeds whose milking properties have been developed, such extravagance would be an outrage to reasonable minds, unless a cow is made to suckle two or three calves during her milking period. In some parts of the country this latter method is followed, but the percentage reared annually by this system is bound to be very small.

No one can deny that sucking the dam will produce the finest calf, but then a rent-paying farmer—if he has not to consider rent he is not, properly speaking, a farmer—must consider the £ s. d.

Colostrum or "Beastings."

In the first week the mother's milk must be given, as the **colostrum** or "beastings," as it is generally called, is entirely of a different composition from ordinary milk, and contains constituents necessary to the stomach of the delicate new-born calf. What is characteristic of colostrum is the presence of certain bodies (colostrum corpuscles) which are never found in normal milk. They are foreign bodies resembling in appearance the white blood corpuscles, and are four or five times the size of the average milk-globules. For the sake of comparison I give analysis of normal milk and "beastings" —

	Colostrum Per cent	Normal milk Per cent
Water	71.69	87.0
Total solids	28.31	13
Fat	3.37	3.9
Casein (albuminoids)	14.83	3.7
Albumin	15.95	
Sugar	2.18	4.7
Ash	1.78	7
	100.00	100.00

The difference in composition will be noticed particularly in total solids, that of the former containing more than twice the normal quantity. The high percentage of albuminoids is due to the presence of that foreign body resembling the white corpuscle of the blood.

Care in Feeding Young Calves.

Before commencing with the actual feeding of the calf it may be just as well to allude to the inner mechanism. The calf is possessed of four stomachs, and it is only the last of these which

is required until the animal commences to eat hay or other solid food. In the fourth stomach there are certain juices or acids which convert the milk into a coagulated mass. This is an elementary fact which should not be lost sight of, showing that the milk should be given in small quantities and often—at least four times a-day in the first week—for the first fortnight or so until the calf begins to chew its cud. The practice of feeding only twice a-day from the commencement ought strongly to be condemned. If the milk is given but twice a-day from the first—as is often the case—the delicate digestion of the calf is not capable of disposing of such a bulk, and some of the old curd is still in its stomach when next fed. When this goes on irritation and inflammation sets in, and the result is the loss of a great number of calves yearly.

Rapid Increase in Weight of Calves.

Mr Warington tells us in his 'Chemistry of the Farm' that "a young calf can store up as flesh 69 per cent of the albuminoids in its milk, and assimilate at the same time 98 per cent of the lime and 74 per cent of the phosphoric acid. During the first few weeks of a calf's life 10 lb. of milk, containing 1.3 lb. of dry matter, will yield 1 lb. of live-weight. A calf will sometimes gain in weight as rapidly as a fattening ox ten times as heavy. This extraordinary rate of increase is due to the very large amount of food consumed in relation to the body weight, to the watery nature of the increase in a young animal, and the small formation of fat." The ordinary milk of the cow has the high albuminoid ratio of 1:36, whereas in colostrum it figures out much higher. When artificial food is given to very young calves these facts should have due consideration, and a diet or substitute given which contains a high percentage of albuminoids and fat.

Substitutes.

On a butter-making farm where a separator is in use we have machine-skimmed milk with its natural heat—i.e., new milk minus the butter-fat. Here we have the substance of the milk before the natural heat is off; all we want is a substitute for what has been extracted, and calves, as a rule, readily adapt themselves and relish the mixture that is given to them. It is for us to decide what is the most profitable, easily handled, and commendable substitute. We have many advertised mixtures in the market varying in price from 12s. to 21s. per cwt. I do not see why a farmer need pay a stipulated price for a mixture for a certain purpose any more than he need purchase a special grass, potato, or turnip manure. He may mix ingredients him-

self, and thus know exactly what he is using. Some calf-meals are sold on the distinct understanding that there is no analysis given along with them, certainly a state of affairs which ought not to exist in view of the provisions of the Fertilizers and Feeding Stuffs Act, 1893.

Linseed.

Of ordinary foods linseed is the one most similar to average new milk in composition. Many calf-rearers realise this, and mix with skimmed milk crushed or pure linseed, boiled or thoroughly scalded. This or some other substitute is given when new milk has been entirely dispensed with after the first three or four weeks, the natural milk being gradually taken away after the first fortnight and the substitute just as gradually taking its place. Many look upon the price of pure linseed as prohibitive. Where oilcake is crushed for older stock, it is no uncommon practice for the powdered cake to be used instead of the pure linseed, under the impression that this answers the same purpose; in fact some dealers make a practice of crushing into powder linseed-cake and selling it for calf-meal. Pure fat is what we are trying to replace in the calf food, and when pure linseed contains about 35 per cent of digestible oil in comparison with 9 per cent in linseed-cake, it is readily seen that the latter by itself cannot be the more profitable of the two, regardless of cost.

The Home-manufactured Substitute.

The home-manufactured substitute will be found superior to most, if not all, advertised foods of a like description, and the cost works out less. This substitute consists of equal weights of linseed, wheat, and oatmeal. The arable farmer grows the latter two, and it is here produced at first cost, the only ingredient requiring to be purchased being linseed. When there is a grist-mill on the steading it is a simple matter mixing linseed and wheat in equal parts and running the mixture through the machine. To this can be added the required amount of oatmeal.

	s.	d.
Cost of linseed per stone	2	0
Cost of oatmeal per stone	1	6
Cost of wheat	1	0
	<hr/>	
	4	6

Or 12s. per cwt.

This is a mixture which will hold its own with any of the advertised substitutes sold for calf-rearing.

Cod-liver Oil.

In the 'Transactions of the Highland and Agricultural Society' for 1898 Dr Gillespie, in his paper on "The Cattle Industry of Scotland," gives some particulars of a calf-rearing experiment conducted on farms occupied by Sir Robert Jardine, Castlemilk, Dumfriesshire. One important point brought out is the use of cod-liver oil as a substitute, and judging from the number of experiments conducted throughout the country since the publication of that paper, one is led to believe there is a great future before this odd calf diet. In addition to county council farms throughout the kingdom making careful experiments as to the respective value of substitutes, many farmers are following along the same lines and adopting cod-liver oil. It has been found, when used along with skim-milk, to give as good results, in comparison with cost, as numerous mixtures under trial.

One great point in favour of cod-liver oil is the facility with which it can be handled. When treating meal mixtures, a certain amount of care and judgment has to be used. The meal must first be moistened with cold water or milk before it is scalded with boiling water. This prevents the meal forming into dry lumps. This precaution may appear a very simple matter, but it is surprising how negligent the majority of servants are. Continued mismanagement of the meal will ruin the digestion of calves in a very few days. The inference is, that personal supervision is of more importance than the quality of the meal.

When using cod-liver oil, all that is necessary is to mix one table-spoonful in every 2 quarts of skimmed milk given, and it is surprising how readily the calves take to this mixture. It is essential that only the pure product be used, and this can be purchased at from 4s. to 5s. per gallon. A cheaper oil is sometimes used for cattle, but for calf-rearing it cannot be recommended. It contains a quantity of fish oil, and after standing for some time generates a bad smell, which is never the case with the pure article.

The oil can either be given as long as the calves get milk or it can be stopped after the first two months—a time when the calves begin to feed—linseed-cake and some meal being given in its place. Where there is little or no milk to use along with the oil it is placed at a disadvantage, and a gruel made up of the home-made substitute can take its place. Calves can be learned to drink a watery gruel, and I have known them to take to blood-hot water and cod-liver oil alone, but the gruel from the home-made substitute must be recommended instead.

Cost of Rearing.

The cost of rearing is a disputable point, for many reasons. In the first case we have the supposed value of the calf when dropped. It may be either a "weed," value 2s. 6d. or 5s. in the open market, or it may be the progeny of a profitable dairy shorthorn, and would be considered cheap at £5. The value of the calf at the commencement has no direct bearing on the actual cost of rearing, although it may be a most important factor when the animal comes to be sold. The value of the milk and substitutes given to the calf is another consideration which may vary according to the circumstances and means the farmer has for disposal of his milk. A calf reared artificially receives 30 gallons of new milk in the first three weeks. If this milk were sold at 6d. it would bring 15s.; valued at 8d., 20s. Again, when we have skim or separated milk to deal with, the estimated difference in value works out to a considerable amount. A calf consuming for five months 2 gallons a-day, valued at 1d. per gallon, costs 25s.; valued at 2d. per gallon, 50s.

These figures altogether depend on the time of year the calf is getting its milk. Compare the months of May and December; the difference in the value of new milk for these two months is certainly not less than 2d. per gallon. Skim or separated milk fluctuates little in value, as it is a by-product, and in the most of cases must be consumed on the farm, therefore it has about the same value to the farmer all the year round. Even when this is recognised, we have differences of opinion as to the consuming value, some placing it as high as 2d. per gallon, whereas from feeding experiments we invariably get the value at 1d. per gallon, and this latter figure is most generally adopted. When working out tables of comparison these figures must be considered. The following table shows the supposed difference in cost of artificial rearing under identical conditions,—the calf is not valued for reasons already given:—

New milk, 40 gallons at 6d. and 8d.	£1 0 0	£1 5 0
Skim-milk, 200 gallons at 1d. and 2d.	0 16 8	1 13 4
Twenty weeks' grass at 6d. and 1s.	0 10 0	1 0 0
Linseed-cake	0 18 0	0 18 0
Cost of milk-substitute first two months	0 2 0	0 2 0
Crushed oats or other meal	0 6 6	0 6 6
Roots and hay first twelve months	2 10 0	2 10 0
	<hr/> £6 3 2	<hr/> £7 14 10

This rough table shows that by merely taking a difference in value of three of the items consumed—and the estimation in each case cannot be considered out of the way—the difference

in cost of twelve months' rearing stands at £1, 11s. 8d. per head. Details of the various foods are not given, because the writer does not deem it necessary. Those who wish to dip further into this particular branch of the subject, will find the above estimates pretty near the exact quantities consumed by artificially reared calves intended for ordinary store or keeping purposes.

The calf begins to pick amongst hay or straw at the age of three or four weeks, and when this is observed a handful of the best of hay should be given. When lea hay is well secured it is surprising how well calves a couple of months old will do on this and 2 gallons of separated milk per day. Of course they do better when a little cake is given or some substitute mixed in the milk.

If the calves are running out, grass takes the place of hay. When they are grazing, from three to six months old, it is always advocated that linseed-cake, or a mixture of linseed-cake, barley-meal, or crushed oats, should be given in addition to the 2 gallons of skim-milk, varying from $\frac{1}{2}$ a lb. to 1 lb. per head daily, according to age. This requires a little more attention when the practice is followed, but if instead of entirely dropping the home-made substitute described above, let it be continued and the amount increased as the calves grow bigger and older, then there is no need for cake or meal of any description to be given. Up to the age of six months it is always advisable to give the calves a drink of thick gruel or porridge, made up entirely of the substitute, when milk is scarce, and on the other hand, when milk is plentiful this can be given with advantage up to nine months old.

Calf Ailments: White Scour.

The care and management of the calf from birth has already been discussed, and when careful attention has been given, there is little fear of ailments, if the calf is healthy when born. The most common affection is white scour. When this terrible ailment has got hold of the steading, the germs get into the system of the calves and carry them off in a very few days. When the pathogenic microbes get a hold and lurk about the corners of a building, eradication is not a simple matter. The cleansing and scouring must be of a pretty severe character. The floors, in the first place, must be attended to; and when these are not cement, and thus impervious to damp, they must be raised, whether flags or cobbles, and all objectionable-looking matter removed. Previous to relaying, all parts of the house should be thoroughly cleansed out and disinfected, the walls being washed down as well as the floor, and the former given a coat

of whitewash. After the floor is relaid it should be disinfected every ten days or so, and good dry bedding is absolutely essential.

Some authorities assert that when the cows are fed on a highly nitrogenous diet, such as cotton-cake, the milk given is of such a composition as to be detrimental to the calves' digestion, thus bringing on the complaint we are discussing. This may be in some cases where the cows are receiving a full concentrated diet of cotton-cake; but if this is mixed with other meals commonly used, the cake can be given up to 4 or 5 lb. daily without any ill effects.

The treatment of the complaint, when once it has got hold of the system, is not very satisfactory. On seeing the first signs of scour give 2 or 4 ounces of castor-oil with a teaspoonful of laudanum. This simple treatment is pretty often successful when used in time; but when it has not the desired effect the dose must be repeated, followed up with a wine-glassful of lime-water each night in the milk.

Navel-ill and Joint-fellon.

Navel-ill is a common disease amongst calves a week or a fortnight old. The dulness of the stretched-out animal first attracts attention, milk is refused, and breathing is faster than normal. The navel will be found to be hard and swollen. This is the first stage of what is known as the fatal disease—joint-fellon. Lameness is noticed in one or more limbs along with enlargement of the joints. When this stage is reached the case is past redemption. Doctoring may have its reward with the milder form—navel-ill.

I can speak of the following treatment, having successfully tried the remedy myself. Cut the hard swollen navel open with a sharp knife and dress the wound with the best of all dressings, carbolic oil. Apply a cotton cloth saturated in this and held in position by a piece of old flannel blanket rolled round the body four or five times. An aperient can be given daily in the form of small doses of castor-oil or Gregory's powder.

We have "doctors differing" as to the actual cause of this ailment. It never happens where the house is kept thoroughly clean and disinfected, with plenty of good dry bedding provided. The navel is the original seat of the disease, and it is the treatment of this part of the body we must look to first. Immediately after birth there is an open wound there, and certainly it is an easy matter to dress this with carbolic oil and tie the navel with a piece of string, thus preventing any disease germs getting into the system through this part.

Hair-balls.

These are often formed in the stomach of a young calf, causing loss of appetite with swelling on the left side, and every indication of internal derangement. There is no cure, and we must try to prevent the formation of these balls. All milk given must be thoroughly strained, as the milk-sieve at certain times of the year shows us how many hairs find their way into the milk in spite of ordinary precaution being taken. Naturally this foreign matter tends to lodge in one of the stomachs, forming into a ball as digestion takes place. This is one of the causes; but where young calves have access to each other they may swallow some hairs in the act of licking their fellows.

Husk or Hoosc.

When calves are being grazed and allowed to run out night and day during the autumn months, they are subject to an attack of husk or hoosc. It is caused by the presence in the windpipe and bronchial tubes of a white thread-worm (*Strongylus micrurus*) varying in length from half an inch to three inches long. These parasites, by their constant movement, set up irritation, causing the animal to give a peculiar short cough. Loss of condition and wheezing follow, and ultimately the animal dies of exhaustion, although it may have taken food almost up to the last.

The parasites, which are the cause of such a loss to some stockowners, frequent marshy undrained land during the months of August, September, and October. They are not always confined to this class of land, for in close damp weather young stock may get hoosc on a sound healthy pasturage. A few nights' frost kills the parasites.

When the calf gets down in condition and wheezing becomes noticeable, little can then be done but treat the animal as an invalid and give plenty of nourishing diet. Doing with a table-spoonful of turpentine in a teacupful of linseed-oil every second or third day on a fasting stomach may have a slight effect during the early stages. We know the worms are in the windpipe and bronchial tubes, therefore direct application of something fatal to the parasites is out of the question, and physicking can never be very satisfactory. Fumigation with iodine or sulphur fumes is more beneficial. This can be done by putting the affected ones in an outhouse with all ventilation-holes stopped, and burning the sulphur on a hot spade. The nature of the malady is such that treatment is rarely satisfactory even when inter-tracheal injections are resorted to by a professional man.

In order to prevent these worms getting into the windpipe,

grazing calves ought to be housed at nights from the beginning of September, and not turned out in the mornings until the dew is off the grass. Keep them in good condition by a liberal diet. It is said that calves which are housed for the first twelve months of their existence never have the complaint.

While I have traced in outline most of the salient points in connection with calf-rearing, this article does not pretend to be an exhaustive treatise on methods and practices adopted throughout the country. The feeding and supposed cost of rearing have perhaps been dealt with rather curtly, but this branch of the subject has received so much attention in the agricultural press and elsewhere, that it was taken for granted it could be lightly touched upon here.

EXPERIMENTAL CONTRIBUTIONS TO THE THEORY OF HEREDITY.

REVERSION AND TELEGENY.

By J. COSGAR EWART, M.D., F.R.S., University of Edinburgh.

WHEN, more than half a century ago, Dr Prosper Lucas was writing his elaborate treatise on Heredity,¹ it was deemed necessary to submit a large body of evidence in support of the fact of heredity. When at about the same time Mr Darwin was arming himself with material for the 'Origin of Species' and his other epoch-making works, a not unimportant part of his labours consisted in searching far and wide for evidence of the fact of variation. Nowadays we are quite prepared to take both heredity and variation for granted, to admit that in both the animal and vegetable kingdoms, amongst wild as well as domestic animals, wild as well as cultivated plants, two forces are constantly in operation, the one striving to maintain the like, the other as constantly endeavouring to propagate the unlike.

Of the two subjects, heredity and variation, the latter is to students of evolution the more interesting and important—variability being, in fact, the fountain and origin of progressive development; for, as Mr Russell Wallace has well said, "individual variability is a general character of all common and widespread species of animals and plants," and, further, "this variability extends, so far as we know, to every part and organ,

¹ L'Hérédité Naturelle, 1847.

whether external or internal, as well as to every mental faculty."¹

Variations are of several kinds. There are abnormal variations which result in degeneration or in monstrosities; there are extreme progressive variations known as "sports," extreme regressive variations of an atavistic nature; and there are normal variations—changes which, from what one knows of the history of the species or variety, might be expected—some in a forward, some in a backward direction. These normal variations may be respectively known as progressive and retrogressive variations. In this paper the retrogressive changes commonly known as reversion will be considered, with a view to ascertaining, amongst other things, whether in addition to reversion to a remote ancestor there is also reversion to a previous mate, as believers in the "infection" or telegony doctrine insist on.

Normal variations in the widest sense may be said to consist of a more or less evident departure in one or more directions from what, by common consent, is for the time being recognised as a typical representative of the species, variety, or race. It may be progressive or regressive, a change in size or colour, an alteration of the external or internal tissues or organs, or, without any apparent change of structure, a difference in the prepotency, or in the habits or mental processes. Obviously the changes in each species, whether progressive or retrogressive, must have a limit for this—amongst other reasons, that germ-plasm in the habit for untold ages of travelling along a certain well-defined route cannot at will follow a new and different route, any more than the tide, after having entered one estuary, can cross the watershed to reach and return by an adjacent estuary. It is inconceivable, however great and rapid may be the changes in the surroundings, that one species can rapidly acquire the fundamental characters of quite a different species, for, notwithstanding the universal want of stability in organic nature, the potentialities of every species are limited. In virtue of its past history it has certain bounds or limits beyond which it is impossible to pass. It is equally inconceivable that a highly specialised form can ever reassume the characters of a quite remote generalised ancestor, that, *e.g.*, a foal might appear resembling in its teeth and limbs a "fossil horse" of the Eocene epoch. This is impossible for the simple reason that, owing to abbreviation, to short cuts during development—to one day in the life-history representing thousands of years in the ancestral history—anything approaching a complete Eocene horse no longer occurs during development.

Since Darwin suggested that the occasional appearance of stripes in horses, the tendency of fancy pigeons, when crossed,

¹ Wallace's *Darwinism*, p. 81.

to adopt the coloration of the wild blue rock-pigeon, and other like phenomena, might be due to retrogressive changes, most evolutionists, notably Spencer, Wallace, Galton, and Weismann, have taken reversion for granted, and accounted, as a rule, for the reappearance of lost traits by an arrest in the developmental process. But, unfortunately, too free a use has often been made of the reversion hypothesis, and the difference between a normal and an abnormal variation too often forgotten. The result of the indiscriminate use of the reversion doctrine is somewhat startling. Our ancestors, *e.g.*, must have been remarkable, not to say grotesque, creatures if they were characterised by half the traits ascribed to them by thoroughgoing reversionists.¹

Mr Darwin from the first made free use of what he called the "principle of reversion." Writing as late as 1881, he says, "Any character of an ancient, generalised, or intermediate form may, and often does, reappear in its descendants after countless generations."²

An equally free use of the reversion hypothesis has been made by breeders; but this is not surprising, for breeders have long out-distanced naturalists in the length of their creed, and having paid little or no attention to biology, they are still amazingly credulous: with rare exceptions they believe firmly in the transmission of acquired characters—in telegony, in the influence of maternal impressions, and in many less likely dogmas.

To Mr Bateson belongs the credit of casting doubt on the reversion hypothesis as commonly interpreted. With some reason he says, "It would probably help the science of biology if the word 'reversion' and the ideas it denotes were wholly dropped, at all events until variation has been studied much more fully than it has yet been."³ If retrogressive changes are but a mimicking, and not an actual recurrence, of ancestral traits, the words reversion, retrogression, and atavism were doubtless better dropped. I shall, however, endeavour to prove that though a too free use has been made of the reversion hypothesis, a recurrence of ancestral traits, due apparently to ancestral protoplasm obtaining control during development, is far from uncommon. If I succeed in this attempt I shall simplify somewhat the study of variation, and at the same time justify the continued use of the word reversion until at least some more appropriate term is introduced.

It may not be possible to give a satisfactory definition of reversion, but it is obviously necessary to state, as accurately as

¹ A single Polyphemus-like mesial eye, shark-like teeth, a cleft palate, and many other abnormalities have been credited to reversion.

² Life and Letters, vol. iii. p. 246.

³ Materials for the Study of Variation, p. 78.

possible, what I mean by the term. When at any stage in the development or in the growth up to the age of maturity ancestral structures or habits make their appearance, the result may be known as reversion, even although they, owing to abbreviation in the ancestral history (phylogeny), only result in hints of once perfect and useful structures. When strictly embryonic or ancestral characters not only persist but increase with advancing years, we have another form of reversion.¹ It may simplify matters to recognise three degrees of retrogression—viz., Regression, Reversion, and Atavism. Offspring which combine in nearly equal proportions the characters of the immediate and remote ancestors (and thus illustrate Mr Galton's law of ancestral heredity) may be said to illustrate regression; offspring which differ from the parents and reproduce the characters (1) of a highly specialised recent ancestor, or (2) of a less specialised common ancestor belonging to the same species, may be held to illustrate reversion; while offspring in which the retrogression is still more pronounced may be said to illustrate atavism. In each case the throwing back must be due to ancestral germ-plasms obtaining the control during development. The disappearance of a frill or peak in fancy pigeons, and the absence of artistic faculty in the children of artists, will serve as examples of regression; the presence of horns in the offspring of polled breeds of cattle, and of a tail in pure-bred Manx kittens, may be given as examples of reversion; while the rudiments of hind limbs in certain snakes and snake-like lizards, and of unusually large ii. and iv. digits in the horse, may be given as instances of atavism.

But it will be well constantly to bear in mind that, though variations agree with stages either in the life or in the ancestral history, it by no means necessarily follows that they are due to Mr Darwin's "principle of reversion," for "the hitting of an old mark when trying to hit a new one" may be a mere accidental coincidence and not an actual surging to the surface of ancestral characters. In other words, the reappearance of lost traits may sometimes be due to progressive or abnormal variation.

Seeing that so many departures from the "specific type" have been ascribed to reversion, it may be well to insist on the fact that when a variation fails to agree with some stage in the development or growth, or with some well-marked but long-lost ancestral trait, it cannot with certainty be included amongst retrogressive changes. For example, a foal with two heads or a single cyclopean eye, with an extra leg or with a cloven hoof, or without a tail, with a very long mane or all but hairless,

¹ When instead of the restoration of lost characters there is in the offspring the absence of recently acquired characters the phenomenon is best known as regression.

would not be an example of reversion, for the very excellent reason that we have no evidence that any of the ancestors of the horse were so characterised. On the other hand, a colt with an upright mane, numerous stripes, one or more small extra hoofs, minute teats, or well-developed first premolars, might be an example of reversion.

That some of the variations in wild, as well as in tame, animals are reversions rather than new creations, was especially realised by Darwin when directing his attention to hybrids. He noticed that traits often appeared in the offspring which, though not present in the parents, were known or believed to have characterised some of their ancestors. Mr Darwin thought that the restoration of lost characters in the case of hybrids might result from antagonism between the germ-plasms derived from distantly related parents. This view, for a time generally adopted, did not find favour with Weismann, to whom we are indebted for an extremely elaborate, though not on that account a more adequate, explanation of the highly obscure reversion phenomena. But though Weismann does not accept Darwin's explanation of regression, he, as already stated, takes reversion for granted. After defining reversion as the "appearance of characteristics which existed in the *more remote* ancestors, but were absent in the *immediate* ancestors—i.e., the parents"¹—Weismann states that the simplest case of reversion occurs in plant hybrids, which, though fertilised by their own pollen, produce offspring some of which more or less resemble only one of the two ancestral species.¹

It is, however, unnecessary to resort to intercrossing to obtain evidence of reversion—it occasionally occurs without any apparent reason, as we say spontaneously, even in inbred stock. An instance of this kind was recently brought to my notice by Professor Bayley Balfour. It occurred in the *Primula* family. From seed of "Crimson King" (a variety with a double crimson flower and palmate leaves) a white variety of *Primula sinensis* suddenly appeared like the *Primula sinensis stellata* commonly cultivated sixty years ago. In the same way in a herd of black polled cattle, as in the herd of white cattle at Chillingham, a reddish-coloured calf occasionally makes its appearance.

From the results obtained by crossing orchids, grasses, roses, &c., I am satisfied abundant evidence of reversion could be easily gleaned from the plant kingdom. I shall, however, confine my attention almost entirely to animals, and more especially to domestic animals. I shall not attempt to give an exhaustive list of the reversions that have occurred in any of the groups passed under review, but rather endeavour to give cases to show that the offspring, while differing from the immediate

¹ The Germ-Plasm, p. 299.

parents, may reproduce more or less accurately a grandparent, or a comparatively recent ancestor, or resemble an intermediate ancestor, or restore more or less completely one or more of the known or presumed peculiarities of a remote ancestor.

4. REVERSION IN THE CARNIVORA.

1. *The Cat Family.*

1. *The Domestic Cat.*—One of my simplest cases of reversion occurred in a litter of kittens recently bred. A tabby-coloured cat of the Persian breed, crossed with a white male of the same breed, produced four kittens, two tabby-coloured and two white.¹ On reaching maturity the two young white cats were interbred and produced four kittens, two pure white like the sire and grand-sire, two tabby-coloured like their grandmother (fig. 32). Theoretically, the four kittens of the first generation as well as the four of the second should have taken equally after their parents and their ancestors—been in colour a mixture of tabby and white. That two of the first generation were white and two tabby does not specially concern us, but an attempt must be made to explain why two of the offspring of the two white parents—a brother and sister—are white, while the other two are tabby-coloured. It might be said (1) that the white kittens inherited their whiteness from their white parents, while the tabby-coloured kittens were “sports,” their resemblance to the grandmother being quite accidental; or (2) that while the white kittens inherited their whiteness from the immediate ancestors, the tabby-coloured kittens inherited their colour from the grandparent and her ancestors. It used to be maintained by Pallas and others that variability was wholly due to crossing. If there are still naturalists who agree with Pallas, they might look upon the tabby-coloured kittens of the two white cats as “sports,” a result of the intercrossing of the differently coloured grandparents, and support this view by quoting Darwin’s statement to the effect that though the offspring of the first generation are generally uniform, “those subsequently produced display an almost infinite diversity of character.”² It is of course possible that the resemblance of a grandchild to the grandmother is a mere coincidence; in other words, if the grandmother and all her ancestors for many generations had been black or blue,

¹ Cross-bred offspring the image of one parent are sometimes described as reverts, but offspring which resemble one of the parents can hardly be said to throw back—when they take after the sire they may be known as sirelings, when after the dam as damlings.

² Animals under Domestication, vol. ii. p. 252.



Fig 32 — Two white and two tabby kittens, the offspring of two white cats.

the grandchild might still have been tabby-coloured. The only way to arrive at a conclusion in a case of this kind is to ascertain what happens in other cross-bred families. I have a fantail pigeon, blue with the exception of the croup and some white feathers about the head, wings, and tail. When this pigeon is crossed with blue pouters, carriers, and common dovescot pigeons, he always produces blue birds; but when crossed with blue or nearly black fantails, he has on four out of five occasions produced pure white fantails like their paternal grandsire. This can hardly be an accident, for when one of the white offspring was interbred with his blue dam, he produced a pure white fantail.¹

When a wild rabbit is crossed with a tame white rabbit all the young are grey in colour; but when two of the grey half-breeds are interbred, they produce, as far as my experience goes, both grey and white young.

Again, when in an English family we find what in Calcutta would be called a 4- or 6-anna "Eurasian," we are not in the habit of regarding the dark child as a "sport," but as evidence that in at least one parent there is a strain of Eastern blood. If the white fantails are the result of reversion, and if the appearance of a "Eurasian" in an English family, or an apparently pure negro in the family of two mulattoes, are due to reversion, I see no reason why it may not be taken for granted that the tabby-coloured kittens are also reversions—reversions rather than "sports" which by a mere accident resemble one of the grandparents.

Assuming that in the tabby kittens we have a case of reversion, the question arises, How can the throwing back to the granddam be accounted for? Mr Darwin's principle of antagonism would not apply, seeing that both parents were not only alike but members of the same litter. Darwin would probably have answered this question by saying the characters of the grandparent were present (latent) in one or both of the immediate parents; but this is only another way of saying the phenomenon was due to "the principle of reversion."

To be in a position to discuss either progressive or retrogressive variation, it is necessary to have some idea of what happens immediately before and during fertilisation—i.e., to realise what is implied by the union or conjugation of the male and female germ-cells.

The essential part of every germ-cell is the central kernel or nucleus, and the essential structures in the nucleus are the nuclear rods or (because they stain easily) chromosomes. The

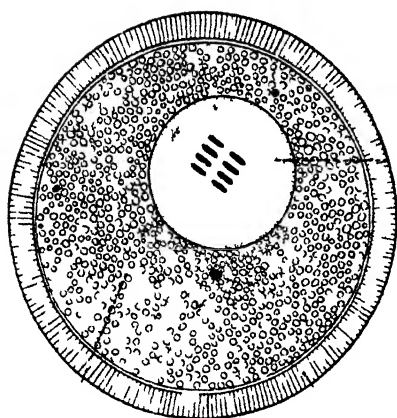
¹ In pigeons it is ~~often~~ difficult to get rid of even a few blue feathers unless in the case of fantails, in which white is the most prepotent, because long the normal colour of the breed.

germ-cell, in which more or less yolk material is stored up to provide nourishment during at least the earlier stages of development, is known as the ovum or female germ-cell. The germ-cell which contains no yolk material, and is hence extremely minute and in most cases provided with a long tail or flagellum (by which it propels itself, until perchance it meets with a ripe ovum), is known as the spermatozoon or male germ-cell. Fig. 33, a still unripe female germ-cell (ovum or macro-gamete), represents eight nuclear rods (chromosomes) in the clear spherical nucleus, lying embedded in the granular protoplasm (cytoplasm). Into the cytoplasm the nucleus of the male germ-cell is subsequently introduced, that it may blend with the *reduced* female nucleus. The cytoplasm provides a suitable environment for the male nucleus first increasing in size and then conjugating with the ripe female nucleus; further, the cytoplasm, by means of its yolk granules, supplies nourishment to the embryo during at least the earlier stages of development. The cytoplasm is invested by a delicate capsule or cell-membrane, which takes no part in forming the new individual. Fig. 34 represents a ripe male germ-cell (sperm or micro-gamete). The sperm figured consists mainly of (1) a nucleus containing four chromosomes (half the number present in the unripe "sperm-mother" cell and in the unripe ovum); (2) a long tail or flagellum by which it wriggles about in search of an ovum; and (3) of a pointed apex by which it penetrates the ovum to deposit its nucleus in the cytoplasm, as shown in fig. 35.

Though the male germ-cell (sperm) is often many times smaller than an ovum or female germ-cell, it, as just indicated, contributes the same number of nuclear rods (chromosomes) as ~~the ovum~~, and is as fully represented as the ovum in all the tissues and organs of both embryo and adult. Germ-cells seem to exist from the embryonic period onwards, but they begin to ripen or mature, as a rule, only when growth has been well advanced—*i.e.*, during adolescence. When an animal produces ripe germ-cells we say it has reached maturity—*i.e.*, it has reached a stage when it is capable of taking part in the reproduction of its species. Maturity is generally reached before the bodily growth is completed.

It seems from the beginning to have been an advantage if not a necessity, in most animals, that the offspring be chips, not of one, but of two blocks—that each new individual should spring, not from one, but from two germ-cells, derived from two separate individuals. Hence the existence of males and females, of individuals to produce male germ-cells, and individuals to produce female germ-cells.

Though it is, in a sense, true that in the vast majority of animals each new individual springs from two germ-cells, it



cytoplasm

cell membrane

Fig. 33 ($\times 750$)

A nearly ripe female germ cell (ovum) with eight nuclear rods in the nucleus

nucleus



nucleus

Flagellum

Fig. 34 ($\times 1000$)

A ripe (reduced) male germ cell or sperm with four nuclear rods

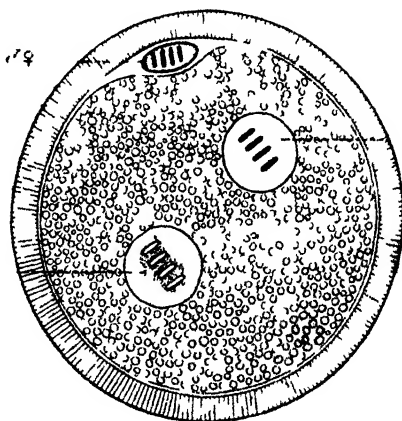


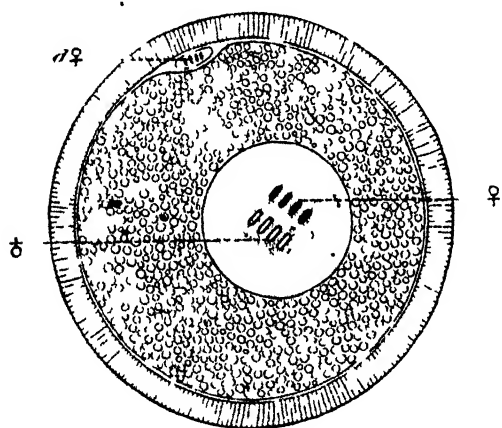
Fig. 35

A ripe ovum from which half of the nuclear rods have been discharged, and into which four new nuclear rods have been introduced by a male germ cell. *d* ♀ the discharged half of the nucleus, *♀* the retained half of the nucleus (female pronucleus), *♂* the half nucleus of a male germ cell (male pronucleus)

would be nearer the truth to say that each new individual springs from two *half* germ-cells—*i.e.*, from two cells, each containing only half the normal number of nuclear rods or chromosomes.

That one of these half germ-cells (the sperm) is minute, naked, and portionless (while, as fig. 33 shows, the other is enclosed in a membrane and provided with an abundant dowry of yolk), in no way diminishes its importance during development, or prevents its entering as fully as the other (the ovum) into every part of the new individual.

The origin of germ-cells has often been discussed. Some have derived them from one set of tissues, some from another, while Darwin, in his theory of pangenesis, assumed that they consisted largely of infinitely minute particles (gemmules)



An oviperm or fertilised ovum. The half nucleus of the male germ cell has united (conjugated) with the half (reduced) nucleus of the female germ cell (ovum) to form a new nucleus. The light rods (δ) represent the male ancestors, the dark (γ) represent the female ancestors, $\delta\gamma$ is the nucleus discharged half of the original nucleus of the ovum. The oviperm by dividing provides the material out of which the new individual is developed.

Fig. 10

which were constantly streaming from the various parts of the body along invisible routes which all converged to the germ-glands.

Instead of regarding germ-cells as having been derived from the individual in which they happen to mature, it would be more accurate to consider them as having come direct from his or her parents, and to look upon them not as originating from material that entered into the formation of any of the tissues or organs of the individual in which they are lodged, but from material specially reserved for the purpose from the outset of development, as it were from a slice of the material out of which the individual (soma) containing them was developed.

It is for this reason that unripe germ-cells agree with the body (somatic) cells in various ways, more especially in having

the same number of chromosomes.¹ But if the number of chromosomes is the same in the offspring as in the parents, it will be evident that the germ-cells before blending must, as already indicated, become in a sense half cells, have the chromosomes reduced by one half. This *reduction* of the chromosomes is effected during the maturing of the germ-cells; it is practically the last act in a not uneventful history. In the case of the male the unripe germ-cell simply divides to form what are virtually half germ-cells, although each is considered a complete spermatozoon. In the female the reduction is effected by the nucleus dividing into two equal halves, each containing the same number of chromosomes. One of the halves is retained, the other is discharged and soon disintegrates, not because it differs from the half retained, but because its ejection from the ovum renders it incapable of conjugating with a sperm.² Fertilisation consists in the union of the half nucleus of the male germ-cell with the half nucleus of the female germ-cell. The union or conjugation takes place in the cytoplasm surrounding the female germ nucleus (figs. 35 and 36). When the new nucleus is formed we have again a perfect cell—a cell having the normal number of nuclear rods or chromosomes. By way of indicating that this new cell consists of nuclear rods from two separate individuals, it may be known as the fertilised ovum or ovisperm. Fig. 35 represents a ripe ovum into which the nucleus of a sperm has been introduced. Half of the nucleus of the ovum (with half of the nuclear rods) has been discharged—it lies between the cytoplasm and the cell-membrane—to form what is known as a polar body (δ ♀), the other half (♀) is getting ready to blend (conjugate) with the nucleus of the sperm (δ) previously deposited in the cytoplasm. The sperm nucleus is as large, and contains as many chromosomes, as the *reduced* female nucleus. The chromosomes of the one are the bearers of the characters of the *ancestors* of the male parent, the chromosomes of the other are the bearers of the characters of the *ancestors* of the female parent. Fig. 36 represents an ovisperm (zygote) immediately after the process of conjugation (fertilisation) has been completed. The nucleus now contains as many chromosomes as the unripe (unreduced) ovum, four (δ) derived from the male and four (♀) from the female parent. By dividing again and again the ovisperm provides material out of which a new individual is eventually

¹ All the members of a species seem to have the same number of chromosomes in the somatic and unripe germ-cells, but while in some species there are few nuclear rods, in others there are many. Man is said to have sixteen chromosomes, the mouse four-and-twenty, while some crustacea have over a hundred in each cell.

² In plants the half of the nucleus discharged (second polar body) sometimes unites with a sperm to form the endosperm, which serves as food for the embryo.

developed. Since chromosomes are now regarded as the bearers of heredity, one would like to know if they agree with each other down to the smallest ultramicroscopic particles, or if, as is probable, they differ from each other, with the result that, were it possible to develop a new individual from each nuclear rod, the individuals thus obtained would differ.

Obviously, if the chromosomes differ among themselves—some, *e.g.*, containing more ancestral germ-plasm than others—it follows that those discharged during “reduction” may differ from the chromosomes retained. In other words, the halving of the nucleus may be a qualitative as well as a quantitative process. One would still more like to understand why, though the male and female half germ-cells unite, their chromosomes seem sometimes to blend incompletely, with the result that the offspring in some respects take more after one parent than the other. Again, one would like to know why sometimes the chromosomes derived from the male, sometimes those derived from the female, completely or all but completely control the development; and especially why, now and again, the ancestral germ-plasm present in the chromosomes so completely obtains the mastery that the offspring, instead of being nearly intermediate between the parents, or a reproduction of one of the parents, very faithfully reproduces the form and features of a remote ancestor—in a word, results in reversion. In the meantime, whether the intermingling of the male and female chromosomes results in reversion or in new departures (new varieties or sports), we cannot do better than assume that there is a struggle between the infinitely little particles of germ-plasm that come into competition with each other during development, and that, as between entire organisms, the fittest or most vigorous particles prevail.

Armed with this information as to the germ-cells, we are now in a position to consider further why two of the four kittens, instead of being white like their parents, resembled their granddam or her ancestors.

Weismann, who has discussed the principle of reversion at considerable length, would probably say that the white kittens were developed from female germ-cells from which the germ-plasm of the tabby-coloured maternal ancestors had been discharged (during “reduction”), uniting with male germ-cells well charged with germ-plasm representing the white paternal ancestors. In the case of the tabby-coloured kittens, he would take for granted the “white” germ-plasm had largely escaped from the ova while it was feebly represented in the sperms. In other words, Weismann would say that the fate of the kittens was settled during the maturation of the germ-cells. It may be impossible to prove that such an explanation is insufficient in

this particular case, but it would be easy enough to prove that it is inapplicable in all cases. For example, were it possible always to arrange for either tabby or white kittens being produced when a tabby female is bred with a white male, it would, I think, be admitted that some other explanation than Weismann's is necessary. An explanation has recently been suggested by certain experiments with rabbits. I find when wild grey rabbits are bred with tame white rabbits, the offspring invariably in colour resemble grey rabbits. The same is the case with rats and mice. In the meantime, all that need be said by way of explanation of the half-breeds resembling the wild parent is, that wild rabbits, rats, and mice—female as well as male—are apt to be prepotent over their tame relatives. When, however, a half-wild, or better, a quarter-wild rabbit is bred with a tame white rabbit, it is possible so to arrange matters that all the young will be either white or grey. In other words, it is possible to enable the grey to control the development—i.e., be prepotent over the white at one time, the white to be prepotent over the grey at another.¹

It is, I consider, impossible to account for these somewhat remarkable results by an application of Weismann's theory of heredity—i.e., by supposing that in some of the germ-cells of both the white parents the germ-plasm of the white grandsire was well represented, while in others the germ-plasm of the dark-coloured dam was equally well represented; and further, that during the "reducing division" the "white" germ-plasm was retained in the one case, the "dark" germ-plasm in the other.

This explanation assumes that the protoplasm discharged from the ovum during reduction differs from the protoplasm retained in the ovum. But there is no evidence of this, and I fail to see from what quarter evidence of the qualitative division of the nucleus can come; and even if real "reduction" were proved, it could not be legitimately used to explain all the offspring resembling the sire at one time, the dam at another, or in other circumstances consisting of three or more varieties.

In the case of rabbits, there are excellent grounds for believing that the difference in the offspring is sometimes due

¹ That this is possible will not appear very remarkable if it is remembered that the offspring of white and wild grey rabbits are always grey, that cross-bred cattle, horses, &c., are often externally the image of the prepotent parent, and that frequently in both plants and animals intercrossing results, not in intermediate forms, but in offspring, some of which very faithfully reproduce the male parent, while others as closely resemble the female.

It is extremely probable that an infinitely minute difference in the nutrition, age, or ripeness of the germ-cells determines the characters of the individuals into which they eventually develop.

to a difference in the ripeness of the germ-cells from which they are developed. In the meantime I am inclined to believe that two of the kittens were white and two dark—not so much because the germ-cells differed in structure as that they differed in their nutrition, and more especially in their ripeness, with the result that in one case the germ-plasm representing the dark grandmother obtained the control, while in the other the control of the development was gained by germ-plasm representing the white sire, or more likely the white grandsire.

This is taking for granted that, as suggested by Spencer and Roux, there is a struggle between the smallest parts of an organism as well as a struggle for survival between the varieties of a species, and that the result of the contention between equivalent parts is, that the fittest and best prevail. As evidence in support of this view, I may mention that I recently mated a white rabbit doe with a large white Angora, and a few minutes afterwards with a grey wild rabbit. When the young eventually arrived they were all grey. On several former occasions the doe in question produced pure white young to the Angora sire. This implies that in the contention between the germ-cells of the two males the "wild" prevailed. If the whole germ-cell of a grey buck wins in the struggle with the entire germ-cell of a white buck, it is more than likely that the units or groups of units composing the victorious male germ-cell will overcome the corresponding units or groups of units in the germ-cell of the white doe, not only during conjugation, but right through the whole period of development and growth.

The "grey" units, like the "grey" sperms, prevail because, like the sperms, they are characterised by greater prepotency. But the vigour of germ-cells, like that of individuals, must depend to a very considerable extent on their nutrition and maturity. Hence as a full-grown man is stronger than a child, and as a backwoodsman is likely to be in better condition than an ill-fed and ill-housed denizen of a great city, a mature germ-cell, more especially if derived from a wild parent, is likely to be more vigorous or prepotent than an immature or unripe germ-cell.

But just as there are differences between the germ-cells of different varieties of the same species, so it may be taken for granted there are differences between the germ-cells of the same individual—differences sufficiently great to give the control of the development at one time to the sire, at another to the dam. It is even conceivable that experiments with over-ripe or stale germ-cells might throw some light on the cause of reversion. If, when the germ-cells begin to deteriorate, the germ-plasm representing the recently acquired and presumably less stable

characters first suffers, the germ-plasm representing the less recent or ancestral characters will be left a free hand in controlling the development.

Before passing from the two white and the two tabby-coloured kittens of the two white cats, I ought to mention that the white ones differ somewhat from their immediate parents, while the dark ones still more differ from their dark grandparent. The white and, to a greater extent, the tabby-coloured kittens, in having long fine hair, small ears, and a short muzzle, resemble more closely the pure-bred Persian great-grandparents than their less pure-bred but more immediate ancestors.

Another but less simple instance of reversion in cats may now be given. It is frequently stated that cross-bred cats, instead of being intermediate in their characters, take either after the one parent or the other. It is doubtless true that when two distinct varieties are crossed, some of the kittens very frequently belong to one variety and some to the other, but, as with other animals, the offspring of cross-bred cats often enough take partly after both immediate ancestors and partly after their less immediate ancestors.

The following case shows how, in one individual, the more striking traits of several ancestors may be curiously blended. A dark Persian cat had four tabby-coloured kittens to a dark tailless male. One of the kittens (a male) is tailless like the sire, one (a female) has a crooked stump of a tail only $2\frac{1}{2}$ inches in length, the other two (both females) have tails of the usual length. The four kittens in their hair, general form, and disposition are quite unlike Persians.

One of the females with a normal tail and the female with the stump-like tail were mated with a white Persian having a splendid tail. The tailed female had five dark kittens, all with normal tails, the stump-tailed one had two white and two dark kittens. One of the white kittens and one of the dark (both females) have normal tails, the other dark kitten (a male) has a vestige of a tail, while in the remaining white kitten (a male) the tail is entirely absent. This white caudate kitten in colour agrees with the sire, in being absolutely tailless it agrees with its maternal grandsire, while in the shape of the head and size of the ears it faithfully reproduces its dam.

Telegony in Cats.—Cats, like most other mammals, are commonly believed not only to throw back to ancestors several generations removed, but also to throw back to a previous mate. From the description given of the germ-cells, it will be evident "infection" of subsequent offspring by other males will only be possible if some of the unused nuclear rods (chromosomes), derived from the first mate, not only find their way into the cytoplasm of subsequent crops of germ

cells, but also (during the process of conjugation), as it were surreptitiously, find their way into the nucleus of the ovisperm—i.e., take the place of some of the chromosomes contributed by the subsequent mate. Infection of either the male or female half germ nucleus (male or female pronucleus, fig. 35), or of the new nucleus (the nucleus of the ovisperm, fig. 36), formed by their union during conjugation, is, to use a Weismann phrase, extremely difficult to imagine. The difficulty is not lessened when it is borne in mind that amongst vertebrates there is not the smallest evidence that the male germ-cells ever survive the period of gestation. In the rabbit, *e.g.*, the period of gestation is thirty days. If in the case of the rabbit some of the sperms introduced to fertilise the first crop of ova were capable of retaining their fertilising power for thirty days they might also fertilise the second crop of ova. But there is no evidence that this has ever happened. On the contrary, there is abundant evidence that in the rabbit, as in other mammals, unused sperms lose their fertilising power and completely disintegrate long before the period of gestation comes to an end. If by any chance minute fragments of disintegrated sperms found their way into the cytoplasm of a maturing ovum, they would, I believe, have no more influence on the structure of the individual about to be developed than bird-nest soup ~~is~~ in transforming men into swallows.

In my experiments with cats I have hitherto failed to find any evidence in support of the "infection" doctrine, and the evidence of "infection" in uncontrolled experiments recorded in the 'Field' and other papers, is at the best but of a circumstantial kind. To take one example. In the 'Journal des Débats' for 9th September 1897, De Variguy describes a case which seems to support the belief in "infection." A cat with a normal tail, after producing kittens to a Manx cat, had several tailless kittens to an ordinary cat. It does not follow, however, that some of the subsequent kittens were tailless because their dam had been previously mated with a cat of the Manx breed. In the case of cats, as in rabbits, dogs, horses, &c., the tail, for quite unaccountable reasons, may be entirely absent. But when some members of a litter of kittens are devoid of tails, the most likely explanation is that tailless individuals occurred in the ancestry of one or both of the parents; in other words, the absence of the tail is due to reversion of an ancestor, not to reversion to a previous mate.

There are at least three possible ways of accounting for subsequent offspring resembling a previous and quite different mate: (1) by saying the dam has been infected by the previous mate; (2) by saying the subsequent offspring have accidentally varied in the same direction as the previous mate; (3) by saying the

subsequent offspring have reverted to an ancestor having the same characters as the previous mate. It is extremely difficult to imagine how a male could so infect his consort that her subsequent offspring by other mates would revert to him,—infection, indeed, borders on the miraculous, and we are not justified in adopting it as an explanation, unless simpler explanations are wholly inadequate.

Moreover, though it is impossible to prove a negative, it is certainly true that the more the positive evidence is discredited, the more the weight of negative experimental evidence increases. It is for this and other reasons that the following undesigned experiment has an important bearing on the question at issue. In a recent discussion in Dublin on cross-breeding, it was mentioned by Mr Sydney Villar, F.R.C.V.S., that he had had under observation a pair of young cats, of a somewhat peculiar variety, obtained from Japan. These cats belonged to a small breed, bluish in colour, with the exception of the ears and extremities, which were black. When the female grew up she first had kittens to a common tabby cat. These kittens showed the characteristic tabby markings. Her next kittens were by her Japanese mate, but in no respect did they suggest the previous tabby-coloured mate.¹ No better experiment than this could well be made with cats. The imported breed was quite distinct, and yet not sufficiently prepotent to swamp the common domestic English cat. Yet, though the first litter was sired by a common tabby, there was no indication whatever of the previous tabby mate in her second and pure-bred litter. There is every reason to believe that similar experiments with other imported foreign breeds would yield like results.

2. *The Lion*.—Lion cubs at birth often present numerous spots, some of which are simple while others remind one of the spots of the jaguar or leopard.² As maturity is reached these markings in most cases all but disappear, but in some females, and even in well-grown Somaliland males, the spots are quite distinct. Have these markings been inherited from richly decorated ancestors, or are they indications that the lion, now that his range has been greatly circumscribed, is making an effort to provide himself with spots or stripes after the fashion of his more ornate relatives? There was a time in the history of our planet when there was no grass-covered plains, no steppes, savannahs, prairies, or veldts, such as now exist. In this remote epoch ungulates and their carnivorous enemies had nothing to

¹ Proc. Nat. Vet. Assoc. 1900, p. 130.

² Mivart says lion cubs "are marked with little transverse bands on each side of the body and with a longitudinal black mark along the middle of the back" (*The Cat*, p. 392). Striped cubs I have never seen, but I have seen week-old cubs as spotted about the head as a Dalmatian dog.

tempt them beyond the great primeval forests, swamps, and jungles.

At the present day the ungulates and the great and small cats that habitually haunt forests and jungles are often either striped (*e.g.*, the tiger) or spotted (*e.g.*, the leopard). From this it may be inferred that the ancestors of the nearly whole-coloured ungulates and carnivores, that now live mainly in the open, were also spotted or striped,—that in the spots on the red-deer calf, and the less distinct spots on the lion cub, we have a hint of the markings that characterised their not very remote ancestors. The lion, powerful, active, and good stalker as he is, has during certain seasons of each year some difficulty in securing his food; during very dry seasons (ever-recurring prolonged droughts) his difficulties are enormously increased. In ordinary circumstances the lion either lies in wait for buffalo, zebra, &c., at the water-holes or on the way to them, or he cleverly stalks his prey up-wind. When at a distance of about twenty feet he makes his spring and seldom misses his kill. Had food been always plentiful and easily realised, the lion might have retained whatever spots and stripes he brought with him from his ancestral home in the forest. If, however, to survive, he must be of the same colour as the ground over which he often moves or on which he lies in wait, one can understand that during periods of scarcity the least decorated individuals would best succeed in the struggle for existence. In these circumstances the disappearance of spots and stripes would only be a question of time.¹ But it may be asked, Why have the cubs not got rid of their markings? This is akin to the oft-repeated question, Why do so many vestiges persist? The answer doubtless is, that whether the cubs are decorated or not is a matter of indifference. One might even go farther and say that in the cubs the spots, &c., may be actually useful. During cubhood the hunting is done by the parents—it is soon enough if the spots vanish as maturity is reached; and further, as the cubs seldom break cover, their markings, as in the case of the young tiger, may help in screening them from prowlers, which would not hesitate to take advantage of the absence of the parents. It may hence be admitted without much hesitation, that in the spots of the young lion we have a reversion to the markings² of his sylvan ancestors. This view is supported by the fact that the more distantly related the parents, the more pronounced the markings. In the 1899 report of the Royal

¹ It is of course possible the markings of the lion disappeared because, counting no longer in the struggle for existence, no effort was made to preserve them.

² The markings may be regarded as reversions rather than the persistence of ancestral decorations, because they are sometimes almost absent from some of the members of a litter. In the 'Transactions of the Royal Irish Academy' (vol. xxviii.) Professor V. Ball gives a plate showing four highly decorated lion cubs.

Zoological Society of Ireland, it is pointed out that "the spots which constitute so distinctive a feature of a lion cub are darker and more definite" in the offspring of a Nubian lion and a Somali lioness than in the cubs belonging to the well-known Dublin strain. This exactly agrees with the results often obtained by intercrossing different races of domestic animals.

3. *Lion-Tiger Hybrids*.—In the case of the tabby kitten we had an instance of reversion to quite a recent ancestor, in the lion cubs partial reversion to a fairly remote ancestor. In lion-tiger hybrids we have probably reversion to still more remote ancestors.

From 1824 to 1833 quite a number of lion-tiger hybrids were bred in a travelling menagerie.¹ The sire was a lion (bred from a Senegal lioness and a Barbary lion), the dam a tigress bred in Calcutta. One of the hybrids, born in Scotland either in 1836 or 1837, found its way to the Edinburgh University Museum, and is now in the Edinburgh Science and Art Museum. This hybrid, in its make and body colour, resembles a young lion, but in its markings, with the exception of the spots on the head and parts of the trunk, it is not unlike a tiger.

One of these lion-tiger hybrids (a male, born at Liverpool in 1833) survived for ten years. At three years it had a short mane like that of an Asiatic lioness, and as it grew ~~the~~ the spots and stripes all but disappeared. The disappearance of the stripes, together with the fact that they were more numerous, less distinct, and simpler in their arrangement than in the tiger, supports the view that they were not derived so much from the immediate tiger parent as from a distant ancestor of the tiger.

II. *The Dog Family.*

Anthropologists assert that three distinct types of tame dogs flourished in Europe during Neolithic times—viz., a small variety (*Canis familiaris palustres*), a large variety allied to the Siberian sledge-dog (*C. f. inostrantzevi*), and a slender variety (*C. f. lessneri*) resembling the Scottish deerhound. The slender deerhound-like dog of Neolithic times, during the Bronze Age, to have given rise to the ancestors of our collies (*C. f. matris optimæ*) and hunting dogs (*C. f. intermedius*).² If our recent hounds and collies have mainly sprung from a slender form not unlike a deerhound, they ought, according to the reversion doctrine, when intercrossed, to produce slender deer-

¹ Mr Pocock in 'Nature,' June 30, 1898, refers to another lion-tiger hybrid on exhibition at Earl's Court, London. An account of lion tiger hybrids, based on papers by Professor Valentine Ball of the Science and Art Museum, Dublin, will be found in Allen's *Naturalists' Library*: Carnivora, Part I. p. 45.

² Deniker, *The Races of Man*, p. 194.

hound-like offspring. This doubtless occasionally happens,—in some of the “lurchers” we have probably reproduced the small head, slender body, and limbs of the *C. f. lesneri* of Neolithic times. But, owing to close in-breeding during recent times, intercrossing in the dog family seldom results in marked reversion. Evidence of this in-breeding we have in crosses between the wolf and the dog. When wild rabbits, rats, and mice are crossed with their respective tame varieties, the young, as a rule, can only with difficulty be distinguished from the wild parent; but crosses (hardly ranking as hybrids) between the dog and the wolf, notwithstanding the oblique eye, drooping tail, and scared look, can usually be readily distinguished from the wolf parent. A cross between a wolf and a foxhound, figured in ‘The Kennel Gazette’ for January 1898, in some respects resembles a lurcher more than a wolf—it probably reproduces roughly one of the principal types of the Neolithic period.

In the case of the dog, more than any other domestic animal, the ancestral history seems to be marked at irregular intervals by highly prepotent types, with the result that when crossing is resorted to, there is always a chance of throwing back to some once familiar strain.

Some years ago I crossed a yellow collie with a well-bred Dalmatian. In this case the puppies were more like foxhounds than deerhounds, probably because their reversion was arrested by a not very remote prepotent ancestor of the inbred Dalmatian. I have come to this conclusion, mainly because the cross-bred pups somewhat resemble in their colour a very old specimen of a Dalmatian hound, exhibited some years ago in the Edinburgh University Natural History Museum. Each pup had four or five somewhat large blotches of a lemon or tan colour scattered over a cream-coloured background, and the head and tail were decidedly hound-like. In this case, the collie and the Dalmatian, being somewhat antagonistic, and neither being by itself able to control the development, the most prepotent of the less remote ancestors had again an opportunity of asserting itself. Recently a well-bred deerhound crossed with the same Dalmatian had a litter of seven pups. It is generally assumed that, when intercrossing is resorted to, the oldest type prevails; but in this case the cross-bred offspring, instead of resembling the ancient deerhound breed, with one exception are nearly black in colour and not unlike pointers: they probably reproduce a fairly remote ancestor of the highly specialised Dalmatian sire.

Similar, though not so striking, results are sometimes obtained without intercrossing. Darwin gives an instance of a pointer throwing back to her great-grandparent. Of seven

puppies produced by this pointer, four, marked with blue and white, were so unlike the immediate ancestors that they were at first supposed to be sired by a greyhound. One of the four which happened to be preserved was afterwards proved to be the image of his great-great-granddam, a well-known pure-bred blue-and-white pointer.¹

Closely related dogs sometimes reproduce most faithfully the characters of a grandparent; but when two distinct breeds are crossed the offspring may either resemble a recent, an intermediate, or a fairly remote ancestor, or they may unite the characters of both breeds with certain ancestral traits, and thus well deserve the name of mongrel. A year ago a mastiff and an unusually small black-and-tan spaniel were both crossed with a young lemon-and-white pointer dog. The pointer-mastiff pups varied greatly in colour and form, and, as far as I could judge, were one and all decided mongrels, as were several of the nine pointer-spaniel pups. But some of the pointer-spaniels resembled spaniels, while others resembled pointers. The only pointer-spaniel pup reared, now that it is full grown, might almost pass for a lemon-coloured pointer. While in every way unlike his recent spaniel ancestors, he very closely agrees with pointers, for though unlike his lemon-and-white sire in being of a nearly uniform lemon colour, he is built on the lines of the less specialised pointers of a former generation. Moreover, though the hind-quarters and tail are relatively larger than in his sire, the ears in son and sire are alike both in formation and colour, and in his attitudes, habits, and disposition he is a pointer pure and simple. In this case the germ-plasm of a recent ancestor of the male parent (the pointer) evidently obtained almost complete control during development. The pointer-spaniel cross and his dam are represented in fig. 37.

Sir Everett Millais had a similar experience when, by way of rejuvenating his bassets, he crossed a typical parti-coloured specimen with a bloodhound. The pups were bassets in form but bloodhounds in colour. In this case the prepotency (inbreeding) of the basset sire was sufficient to ensure the basset form being handed on, but it was incapable of transmitting the basset colours. In the basset-bloodhound pups we have an instance of reversion in colour to the whole coloured bloodhound-like ancestors, but no evident reversion in form. Had these half-bred bassets been interbred, some of the offspring would in all probability have been bassets in colour as well as in build—i.e., some would have reverted to the basset grandsire.

A large number of instances of ordinary reversion in the dog family could easily be given, but it will be more interesting to inquire whether, in addition to reversion to an ancestor more or

¹ Animals under Domestication, vol. ii. p. 34.

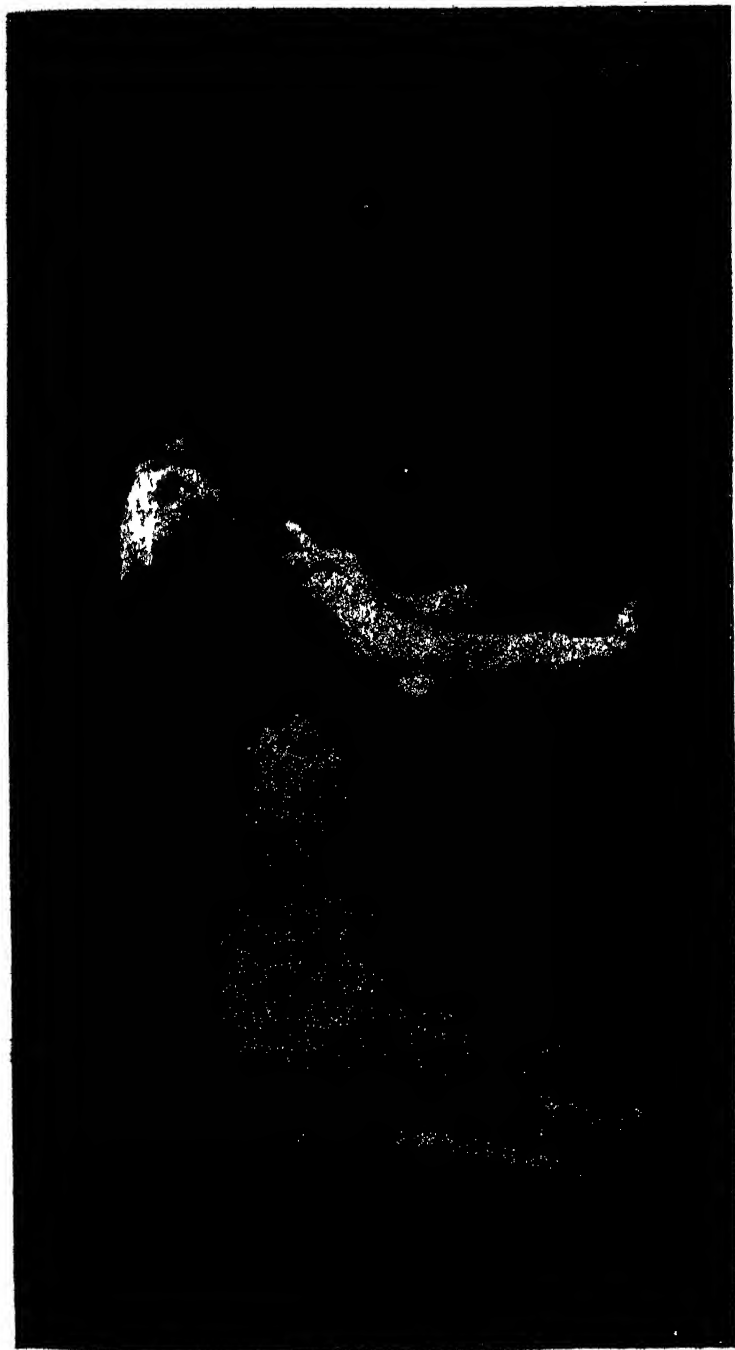


Fig. 87.—A small black-and tan spaniel and her lemon-coloured son, by a lemon-and white pointer.

less remote, there is also at times reversion to a previous mate belonging to a quite different strain or breed.

Telegony in Dogs.—There seems to be an intimate relation between the number of breeds included in a variety or species and the extent and intensity of the belief in telegony—the greater the number of breeds the firmer the belief in “infection.” This is doubtless because the greater the number of breeds the greater the chance of reversion, and the oftener the need of accounting for the offspring differing from the immediate ancestors. It is probably for this reason that fanciers, and especially dog-fanciers, are so wedded to the doctrine of “infection,” and believe so firmly in throwing back to a previous mate. Breeders of horses, sheep, and cattle seem often to have some difficulty in clearly distinguishing between a previous mate and an ancestor. Dog-fanciers, on the other hand, clearly realise what is implied by a previous mate, and are, as a rule, always ready to give reasons for their belief. Moreover, many of them live up to their convictions. Not a few valuable dogs have been destroyed because of the belief in “infection,” while others have been deliberately “infected” with a view to if possible restore, without actual intercrossing, some lost or vanishing characteristics. I heard recently of a sporting farmer who, a generation ago, rejuvenated (?) his greyhounds by “infecting” them with a bull-dog; and according to Professor Oliver, a similar practice still prevails amongst breeders of Bedlington terriers. Professor Oliver tells us these terriers are first crossed with a bull-terrier dog, with the result that their subsequent pure-bred offspring “have stronger jaws than they otherwise would have had, and they also show much of the gameness of the bull-terrier.” Evidently Professor Oliver firmly believes in this extraordinary kind of throwing back to a previous mate, for he proceeds to say, “Anatomical structure and physiological characters are therefore present in the second litter which do not belong to the breed at all, and they could only have come from the bull-terrier.”¹ Unfortunately Professor Oliver makes no attempt to prove that either anatomical structures or physiological characters are really inherited from the previous mate.² English physiologists have frequently indicated that they consider “infection of the germ” well within the bounds of possibilities. I was hence not surprised at Professor Oliver’s attitude, but, unless better evidence of “infection” is forthcoming, some may be tempted to ask, Have

¹ The Lancet, November 10, 1900.

² Mr Tegetmeier has pointed out that, according to Mr Rawdon Lee, breeders are not in the habit of crossing their Bedlington terriers with a bull-terrier dog (the ‘Field,’ 24th November 1900).

physiologists, as well as breeders, been "infected" with the telegony doctrine?

When it is remembered that we are surprisingly ignorant of the origin of the various breeds of dogs,¹ and that, however pure the breed, reversion to a former ancestor may at any moment occur, it will, I think, be admitted that, for the purpose of testing the "infection" doctrine, the dog, of all our domestic animals, is the least satisfactory.² But though thousands of experiments (mostly unintentional) with dogs are made annually, I have never heard of one that affords unequivocal support to the "infection" doctrine. I have heard from many fanciers, who firmly believe in the throwing back to a previous mate hypothesis, but they either say that they have never actually known a case of telegony or that they are unable to supply trustworthy evidence in support of the cases that came under their notice. Sir Everett Millais says that during thirty years' experience he only came across one instance of "infection." Sir Everett, like not a few others, persuaded himself that "infection" was possible but very rare, and hence abnormal. The case he gives in support of "infection"—that of a fox-terrier which was supposed to throw back to a Dalmatian—breaks down the moment it is subjected to criticism.

Uncontrolled telegony experiments are not only worthless, they are often extremely misleading, and yet, as far as I can learn, no attempt has ever been made to thoroughly test the validity of any of the supposed instances of "infection" in dogs. It is quite possible, as some say, that, though mares are not liable to be "infected," dogs are; but no serious attempt has been made to prove dogs are more liable to be "infected" than other domestic animals. For an experiment of this kind it is necessary, first of all, to consider very fully the best breeds to work with, and then with great care to select the individuals required. One of our oldest breeds is undoubtedly the Scottish deerhound, and one of the most specialised is the Dalmatian or carriage dog. I would suggest that two female deerhounds (members of the same litter, or at least full sisters) be first mated with a Dalmatian (a dachshund, a poodle, a chow-chow, or some other well-marked foreign breed might do as well), and then put to their own sire. By way of a control experiment two

¹ The multiple origin of dogs—i.e., their descent from several wild varieties or species of the genus *Canis*—is generally taken for granted. See Darwin's 'Life and Letters,' vol. ii. p. 230.

² Mr C. H. Lane, discussing toy spaniels in his book 'All About Dogs,' says, "I have been told by breeders they have had in one litter a specimen of all four breeds"—i.e., of King Charles, Prince Charles, Blenheim, and Ruby spaniels. In the same way rough and smooth terriers often occur in the same litter, not because of infection but because of reversion.

other full sisters, that had never previously bred, should, at or about the same time, be mated with the same sire. Hitherto it has been the practice to destroy the cross-bred offspring, but in a test experiment every member of the six litters bred should be either kept alive or preserved in spirit. The result of a series of carefully controlled experiments would, I believe, fail to give any support to the widespread belief that at least in the dog family there is now and again reversion to a previous mate.

B. REVERSION IN THE RODENTIA.

Rabbits, Rats, and Mice.

Darwin states that "when variously coloured rabbits are set free in Europe under their natural conditions they generally revert to the original grey colour," adding, this may be in part due to the tendency in all crossed animals to revert to their premordial state.¹ Subsequently he states that the reversion to the grey colour "does really occur, but we should remember that oddly coloured and conspicuous animals would suffer much from beasts of prey and from being easily shot."²

From these statements it is not very clear whether or not Darwin believed there is a stronger tendency in feral than in domestic animals to reacquire their primitive or ancestral characters. Darwin, however, makes it sufficiently clear elsewhere that he did not agree with the common belief "that feral animals and plants invariably return to their primitive specific type."³ What, it may be asked, is meant by returning to the "primitive specific type"? We know that sheep, horses, and other ungulates, dogs, cats, stoats, and other flesh-eaters, variable hares and other rodents, respond freely, it may be rapidly, to climatic and other changes. Yet it is not, I imagine, assumed that in the case of any of the domestic animals marked reversion takes place in a single lifetime; that, *e.g.*, individual white rabbits become grey, that white or black sheep, cattle, or horses assume a dun tint, or that individual dogs gradually acquire the colour, form, and scared look of a wolf.

If it is not assumed reversion to the original form and colour takes place in feral animals in a single lifetime, is it assumed that in response to external stimuli their descendants gradually reacquire the characters of the wild varieties living in the same area because of a latent tendency to reversion? My observations seem to show that the tendencies of animals in a normal environment are exactly the same after as they are before they

¹ *Animals and Plants*, 1868, vol. i. p. 111.

² *Ibid.*, vol. ii. p. 33.

³ *Ibid.*, vol. ii. p. 32.

become feral, the apparent reversion being in most cases due to intercrossing and environmental selection. When, *e.g.*, white rabbits are set free in the vicinity of a hamlet—which affords a certain amount of protection and tends to limit intercrossing with the wild grey rabbit—at least a remnant retain the white colour and alter but little in size and disposition.

On the other hand, if white rabbits, or, for that matter, any of the many varieties of tame rabbits, freely intermingle in a warren or in the open with wild rabbits, white and parti-coloured individuals are sooner or later conspicuous by their absence. ~~The disappearance~~ is not due to any of the individuals assuming the wild colour, nor yet to the pure-bred offspring being oftener grey than was the case before they became feral. The white and parti-coloured individuals disappear either because, being often conspicuous and confiding, they readily fall a prey to their natural enemies, or because they are swamped by intercrossing with wild rabbits. The swamping, however, requires some time, for this reason that although half-wild rabbits (*i.e.*, first crosses), as a rule, closely resemble the wild parent, the offspring of half-wild parents (*i.e.*, second crosses) may be any colour from white to black—some of them, in fact, revert to the tame grandparents. From experiments already made it may be assumed that were, say, a score of highly prepotent but not too conspicuous tame rabbits isolated on an uninhabited island with a like number of not too inbred wild rabbits, the result might not be reversion on the part of the tame, but the complete disappearance of the wild rabbits—they might be swamped by the more prepotent tame variety. Nevertheless, were all the wild rabbits exterminated on one of the western islands of Scotland, and representatives of the more common breeds of tame rabbits introduced, the final result would doubtless be a colony of grey rabbits. This would be chiefly due to the environment favouring the inconspicuous grey colour, partly to the reversion that invariably accompanies intercrossing, and partly also, perhaps, because in the case of the rabbit, grey, more than any other colour, carries in its train greater vigour and hardiness.

When rabbits are introduced into new areas the result seems to vary with the environments. Early in the fifteenth century rabbits were introduced into Porto Santo. The kind of rabbit introduced is not recorded. All that is known is that when Gonzales Zarco, in 1418 or 1419, touched at Porto Santo, a doe and her litter of young, born during the voyage, were set free on the island. Porto Santo proved a paradise to the rabbit. Within its sea-girt walls it neither harboured beasts of prey nor other terrestrial mammalian competitors, with the result that when Cada Mosto visited Porto Santo shortly after the middle of the

fifteenth century rabbits were as plentiful as they are now in some parts of Australia. When some forty years ago Darwin examined specimens of the Porto Santo rabbits he found that they were wonderfully uniform in size and coloration, but not only considerably smaller than the wild English rabbit, but without the characteristic dark hairs on the upper surface of the tail and the tips of the ears. Darwin, in discussing these changes, says that in addition to the new conditions we have to consider the tendency to reversion and the natural selection of the finest shades of difference¹. But as two Porto Santo rabbits,² after a few years' confinement in the Zoological Gardens, assumed the original coloration of the wild rabbit, absence of dark fur on the ears and tail was evidently due to a difference in climate and not to reversion. The reacquiring of the normal coloration in a single lifetime is, however, an instance of reversion.

Further evidence of the fact recognised by Darwin, that when rabbits run wild in foreign countries they by no means always revert to their aboriginal colour, we have in the feral rabbits once common in Jamaica and still found in the Falkland Islands.³ In 1851 Gosse⁴ describes the feral rabbits in Jamaica as slate-coloured, deeply tinted with sprinklings of white on the neck, shoulders, and back, softening off to blue-white under the breast and belly.⁵ Why a slate-coloured variety prevailed in Jamaica to the exclusion of a grey variety it is impossible to say. In the Falkland Islands the colour of the feral rabbits varies considerably—some are grey, others are of a brown tint with white patches on their faces, while others are black. On Rabbit Island they are mostly of a bluish tint. It is worth mentioning that black, reddish-brown, and bluish-coloured rabbits are not uncommon in English warrens where wild and tame varieties have been allowed to interbreed.

That the colour of rabbits in foreign countries is the result of environmental selection may be inferred from what we know of the variable hare. In the Highlands of Scotland, with the exception of the tips of the ears, the mountain hare is white in winter and of a bluish tint in summer. Throughout the greater part of Ireland it closely resembles, both in summer and winter, the common English brown hare, while on an almost completely isolated peninsula at Malahide, in the county of Dublin, it is throughout the year of a yellow colour.⁶ In each case the

¹ *Animals and Plants*, 1868, vol. ii. p. 279.

² *Loc. cit.*, vol. i. p. 114.

³ *Animals and Plants*, 1868, vol. i. p. 112.

⁴ *Sojourn in Jamaica*, p. 441.

⁵ Slate-coloured rabbits similar to those described by Gosse are sometimes obtained by interbreeding half-wild grey rabbits.

⁶ In the island of Mull some of the mountain hares do not turn white in winter. As yellow hares sometimes occur in Mull, it may be indebted to Ireland for some of its variable hares. A yellow hare from Mull may be seen in the Edinburgh Science and Art Museum.

colour is adapted to the environment—in the Highlands the hare may be said to revert towards the ancestral colour during summer. It would be interesting to see whether the Irish varieties of the variable hare would turn white in winter if introduced into the Scottish Highlands.

Though there is no evidence that feral rabbits in Europe are more likely to revert to the aboriginal colour than rabbits kept in hutches, there is no doubt that reversion amongst rabbits is comparatively common, especially when intercrossing is resorted to. When two varieties are crossed all the offspring may closely resemble one of the parents. For example, as already mentioned, when a male or female wild rabbit is mated with a tame white rabbit, all the young in colour, make, and habits are surprisingly like the wild parent. Again, when a Himalaya is crossed with a silver-grey rabbit, all the young are silver-greys in colour, though not quite silver-greys in make. Cross-bred rabbits that inherit, or appear to inherit, the full characters of one parent are instances of exclusive inheritance. But in as far as they resemble a grandparent as well as a parent they may be regarded as instances of reversion. Professor Karl Pearson¹ would describe cross-bred half-wild rabbits as having reverted to the wild parent, but, with Weismann, I prefer not to look upon offspring as reverts unless they differ from the parents and reproduce the characters of a grandparent or a still more remote ancestor.

Had the half-wild rabbits been a mixture of white and grey, and had the Himalaya silver-grey crosses been light silver-greys (chinchillas) with dark points—in other words, had they, like blue-grey cattle, been a blend of their immediate and less remote ancestors, they would have been instances of regression, and served to illustrate Mr Galton's law of ancestral heredity.

While first crosses frequently either illustrate exclusive inheritance or blended inheritance, second crosses as frequently illustrate reversion. The half-wild and half-Himalaya crosses are no exception to this rule. The offspring of two half-wild rabbits vary greatly, but, as far as my experience goes, at least one takes after the white grandparent. In the same way some of the offspring of Himalaya silver-grey crosses are Himalayas pure and simple, while others are silver-greys pure and simple.

Professor Karl Pearson, when discussing the law of Reversion, says, "To find reversion we must investigate cases in which characters do not blend—i.e., the individual takes exclusively after some one member of the ancestry."² And again, "When the inheritance from a variety of ancestors is *blended*, the idea of reversion becomes very obscure; I venture to think meaningless."² In the case of rabbits it is, I venture to think, possible

¹ Proceedings, Royal Society, vol. lxi No. 426.

² *Loc. cit.*, p. 141.

to find reversion even when the characters are not only blended but inherited from a variety of ancestors. To take an example. Amongst the offspring of half-wild (wild-white) crosses dark silver-greys and chinchillas (or light silver-greys) sometimes occur. These silver-greys and chinchillas, when interbred, produce young only differing from Himalayas in having brown instead of black points—*i.e.*, albinos with brown ears and feet and a brown muzzle and tail. In these crosses we have a blending of the characters of the great-grandparents, the dark points (so characteristic of many members of the genus *Lepus*) coming from the pure-bred wild ancestors, the white parts and red eyes from the white tame ancestors. In Himalayas bred in this way we have not "regression towards mediocrity," nor yet offspring taking exclusively after one member of the ancestry, but the surging to the surface of the most fixed characters of the great-grandparents. Himalayas—perhaps because they are a blend of two well-marked prepotent varieties—breed wonderfully true, but the young during the first two or three weeks are either white all over—ears, muzzle, feet, and tail included—or they for a time resemble young chinchillas or young silver-greys.

In the case of rabbits it would be easy multiplying instances of reversion to fairly remote known ancestors. I shall, however, only refer to one more instance, because it has some bearing on certain recent "infection" experiments referred to below. A smooth-coated white rabbit (a cross between an Angora and a smooth-coated white buck) mated with a smooth-coated doe with very light-grey points (the granddaughter of a Himalaya), produced a litter of three, one of which is the image of the mother, one is an Angora like the paternal grandmother, while the third is a Himalaya like the maternal great-grandmother. In fig. 38, which represents the three members of this litter, the middle rabbit is the Angora, the one to the left is the Himalaya, while the one on the right faithfully reproduces the mother. All three are females. It may be worth while adding that even in the Angora member of the litter there were latent Himalaya characters, for when crossed with a half-wild buck (a wild-white cross) she produced a pure silver-grey doe and two bucks with light-grey points like their grandmother.

Experiments with rats and mice gave results so ~~like~~ those obtained with rabbits that they need not be described in detail. Two sets of results may, however, be referred to, because they demonstrate the supreme importance of control experiments. Wild brown and tame white rats yield brown offspring. The half-bred (white-brown) crosses when interbred, as a rule, produce both white and brown offspring, while when the second crosses are interbred some of the young are frequently black. A black rat obtained in this way, crossed with a brown

rat, may yield black, white, brown, and parti-coloured offspring. Were a black female rat of mixed origin, after being mated with a white rat, to yield to a brown rat one or more white young, many would at once jump to the conclusion that she had been infected by her former white mate. There is danger of a similar mistake being made with mice. A mouse obtained from a dealer, and said to be wild, mated with a white male, produced eight young, some of which were white, some grey, some white-and-grey. This so-called wild doe when mated with a supposed wild male again produced a mixed litter, from which it was inferred that she had been infected by her previous white mate. When inquiries were made it was ascertained that the purchased



Fig 38 — *Three full nursers*

and apparently wild doe had been captured in a cellar where tame white mice had run wild. Further experiments with pure-bred wild mice made it abundantly evident that the purchased grey female was a cross-bred specimen.

Telegony in Rabbits, Rats, and Mice — Many breeders of rabbits, rats, and mice firmly believe in telegony. When one considers how variable rodents often are, this is not to be wondered at. When it is forgotten intercrossing is apt to induce an epidemic of variation, and when the possibility of throwing back to former ancestors (*i.e.*, reversion) is ignored, the explanation offered by the telegony hypothesis is naturally adopted. That breeders and others who have not made a study

of variation so readily subscribe to the "infection" theory is exactly what might be expected. Only two sets of experiments bearing on the telegony doctrine need be here alluded to—viz., (1) experiments by Mr C. J. Pound, bacteriologist to the Queensland Government, and (2) experiments by Dr Bond of Leicester. Mr Pound¹ crossed a grey rabbit with a grey-and-white buck, and then mated her with a black buck, with the result that in the second litter there were grey-and-white as well as grey-and-black young. Again, a female black rat after breeding with a pure white rat produced to a brown rat white, brown, and piebald offspring. It is not stated what conclusions Mr Pound drew from these experiments, but his reporter, Mr Gordon, boldly asserts that when only the colour is considered they fully prove the doctrine of telegony. Although (owing to the fact that prejudices die hard) the Queensland experiments were regarded by some as extremely important and convincing, I have no hesitation in saying they afford no evidence whatever in support of the belief in telegony. Had Mr Pound made a number of control experiments he would doubtless have discovered that black female rats sometimes yield to a brown rat white, brown, and piebald offspring, without having been first mated with a white rat, and that grey doe rabbits often produce to a black buck grey-and-white as well as grey-and-black young.

The results of Dr Bond's experiments were communicated to the Leicester Literary and Philosophical Society.² Dr Bond, like Mr Pound, experimented with rats and rabbits,³ but the conclusion arrived at was quite different. The experiments with rats afforded no support to the "infection" doctrine, while the experiments with rabbits afforded evidence of reversion not to a previous mate but to a former ancestor. In considering these experiments the question at once arises, Would the results have been the same had the does been from the first mated with bucks of their own breed—i.e., had there never been a chance of "infection"? Dr Bond used Himalaya and wild rabbits. The Himalaya, as already indicated, is a manufactured breed, and hence, like all such breeds, somewhat unstable, liable to throw back to the dark and light silver-greys generally used in its production.

On several occasions the Himalaya does, after having young to a wild buck, threw one or more greyish offspring to pure Himalaya bucks. Dr Bond points out "that young Himalayas of pure-bred parents, in whose ancestry there is no suspicion of

¹ See paper by Mr P. R. Gordon in 'Australian Pastoral,' 15th June 1900.

² Vol. v., October 1899.

³ Transactions of the Leicester Literary and Philosophical Society, vol. v., October 1899.

a wild cross, are occasionally born grey in colour and tend to become white as they grow older." This led him to regard the grey colour in the subsequent offspring as insufficient evidence of telegony "as ordinarily understood."

That all the indications of "infection" in Dr Bond's experiments are capable of being explained by the reversion hypothesis may be inferred from what has already been said about Himalaya rabbits. But Dr Bond was not altogether satisfied that the grey colour of some of the subsequent offspring was due to ordinary reversion, for he proceeds to hint that though the unused sperms of the first mate do not actually fertilise succeeding crops of ova, they may "exert an influence either on the maternal tissues, and so indirectly on the embryo, or directly on the ova themselves . . . in the way of influencing the nutrition of the future ova." He, in fact, after coming to the conclusion that his experiments afford no evidence of "infection" as ordinarily understood, proceeds to say that they to a certain extent support telegony in as far as they point to an influence akin to "captivity, artificial conditions, in-breeding, food-supply, &c., all of which are believed to favour reversion in offspring." This virtually amounts to saying that intercrossing, like captivity, in-breeding, &c., may lead to reversion; but reversion of this kind is not telegony, which, to prevent confusion, must be limited to throwing back to a previous mate of the dam.

When discussing two years ago how the previous mate might influence the subsequent progeny by other mates, I said, "The influence of the previous sire [mate] may be so feeble that . . . it may only set up sufficient disturbance in the reproductive system of the dam to lead to a slight regression towards her own particular and not very remote ancestors."¹ In all the so-called cases of telegony that I have seen there was reversion not to a previous mate but to previous ancestors of the dam. Breeders, and those who speak for them, as a rule, firmly believe that a female animal after having offspring to a male of a different breed is apt subsequently to produce "tainted," or at least unsatisfactory, offspring to a male of her own breed. Hitherto I have failed entirely to find evidence of this allegation (which by no means implies "infection"). Believers in the infection doctrine apparently fail to realise that the unexpected traits found in the subsequent offspring might have appeared had the dams been from the first mated with males of their own breed. Until breeders produce evidence in support of their beliefs from a series of carefully controlled experiments they can hardly expect their assertions to carry much weight. They will gain little by saying that

¹ The Penicuk Experiments, pp. 143, 144.

stud-books afford ample evidence of "infection"; that almost any observant medical man can furnish instances of telegony; or that the opinions and beliefs of experienced stock-breeders are formed on the experience of centuries,¹ nor yet by pointing out that "people who elect to regard telegony as impossible resemble those who look for an explanation in the clouds when it is lying at their feet."²

It is conceivable, as I previously hinted, and as Dr Bond suggests, that cross-bred offspring may in some cases indirectly influence the nutrition of the future ova, but we are still a long way from having reliable evidence of this. I say it is conceivable, because the characters of the offspring seem to depend to a certain extent on the nutrition and ripeness of the germ-cells. If cross-bred offspring before or after birth, by their greater vigour or quicker growth, cause an extra strain on the dam, it is possible the germ-cells in process of maturing may sometimes suffer, with the result that pure-bred subsequent offspring afford indications of reversion to a former ancestor. Whether further experiments will favour this assumption remains to be seen.

C. REVERSION IN THE UNGULATA.

1. *The Equidæ*.—The many "vestiges" of bones, muscles, ligaments, and tendons hidden away in the limbs of the horse inevitably lead to the conclusion that the Equidæ have sprung from simple ancestors with limbs built on the lines of the tapir. Does the geological record support this conclusion, confirm the view that recent horses, instead of being special creations, have descended from primitive small-brained, loose-jointed ancestors, having the wrist (knee) and heel (hock) but little raised from the ground, and each limb provided with five small-hoofed digits? This question is best answered by an inspection of the American "fossil horses" in the Natural History Museum in the New York National Park. This unique and suggestive collection plainly demonstrates (1) that in early Eocene times—*i.e.*, shortly after the end of the Chalk period—there flourished a semi-plantigrade creature not much larger than a wolf, but sufficiently simple in construction to be the common ancestor of our sheep, cattle, horses, and other ungulates; and (2) that as age succeeded age larger and more highly organised forms again and again displaced less favoured forms, until at the end of the Miocene, or at latest the beginning of the Pliocene epoch, there appeared the odd-toed but now long extinct "fossil horse" known to naturalists as *Protohippus*—a mammal well deserving a place in the great Equidæ group, notwithstanding the small second and fourth digits.

- *Australasian*, November 10, 1900

² *Glasgow Herald*, July 14, 1900.

The New York collection affords strong evidence of the belief that the Pliocene horses were the lineal descendants of the small primitive five-hoofed "fossil horses" of the early Eocene, and they are as eloquent in connecting the three-toed *Protohippus* with the familiar recent horses, in which each limb is provided with only a single complete digit. According to the geological record, *Protohippus*, during Pliocene times, extended its range in a westerly direction into Asia and in a southerly direction into South America. But in Pliocene, as in Eocene and Miocene times, further changes occurred, and eventually both in the Old World and the New three-toed horses were succeeded by one-toed forms practically identical with those now living. For some inexplicable reason all the one-toed, as well as the three-toed, horses in America in course of time disappeared, and hence the New World was quite destitute of horses when first visited by the Spaniards in the fifteenth century.

Though there is no gap in the record between the highly specialised recent horse and the small primitive, early Eocene five-toed "fossil horse," it might be argued that there is no actual proof of their genetic relationship. Further evidence of the relationship between *Protohippus* and its less specialised Miocene and Eocene representatives can hardly be looked for from the rocks, but confirmatory evidence of their belonging to one family might very well be expected from embryology. In this case, fortunately, the embryological method has not proved a broken reed, for, as I proved some years ago, the recent horse passes through a *Protohippus* stage during its development, and thus affords conclusive evidence that three-toed forms are included amongst its less remote ancestors. This warrants the deduction that, as one-hoofed recent horses are related to three-hoofed Pliocene forms, the latter are related to the still older five-hoofed primitive Eocene ungulates.

Equally conclusive evidence of the evolution of the horse from lowly organised Eocene mammals is obtained by a study of the teeth of the extinct odd-toed ungulates, and of their cranial capacity which reveals a gradual increase in the size of the brain. In the case of the teeth there has been a gradual lengthening of the crowns, an increase in the complexity of the enamel folds which give so much character to the cheek teeth in the horse, and a reduction in the size of the first premolar (wolf-tooth) until in most cases only a useless vestige is left.

From what has been said of the history of the horse it will be obvious that reversion in the *Equidae* will be in the direction of *Protohippus* or of even more remote ancestors. By vestiges (rudiments of some writers) we usually mean useless or all but useless fragments or relics of once well-developed useful structures

or organs. In as far as vestiges are functionless they count for nothing in the struggle for existence, which implies that little or nothing is done to maintain them at a definite size or standard. The result is they are apt to vary, are large, and it may be sources of danger, in some individuals, minute and quite harmless in others—*i.e.*, they vary more than useful structures. They may even occasionally regain, at least for a time, their original size, though owing to altered circumstances they may be worse than useless. When this happens we have an extreme form of reversion—the reappearance of structures no longer characteristic of the genus or family—which is perhaps best known as atavism. The limbs sometimes found in young adders are examples of this extreme kind of retrogression.¹ In the first upper premolar (wolf-tooth) of the horse we have a vestige of a tooth well developed and functional in the three-toed Pliocene horses. In the cats, owing to the shortening of the upper jaw, the molars are represented by a single small peg lying internal to the last premolar. In the horse, owing mainly to the increase in size of the second, third, and fourth premolars, the first premolar is, as a rule, either absent or represented by a small peg (not unlike the corresponding tooth in the wolf) lying internal to the first premolar. In the zebras the first premolar persists longer and is usually larger than in the horse. Sometimes both in young horses and zebras the first premolar, on at least one side, is nearly as large as in *Protohippus*. That the wolf-tooth varies greatly suggests its being a vestige; when, as is sometimes the case both in horse and zebra colts, it is nearly as large as in *Protohippus*, its size may be said to result from reversion.

In recent ungulates the outer bone (*ulna*) of the forearm is usually incomplete and attenuated, while the outer bone (*fibula*) of the leg is often represented by two widely separated small fragments. In the Eocene "fossil horses" the *ulna* and *fibula* were not only complete but well-developed. In a two months' horse embryo the *ulna* and *fibula* are relatively as large as in the five-hoofed Eocene ungulates, and though the *fibula* soon dwindles, the *ulna* is still complete at birth, and in a small percentage of cases, though the shaft is greatly attenuated, it remains complete throughout life. Hence in the skeleton of the limbs we have during development a restoration of the conditions that characterised the Eocene ancestors of the ungulates, and sometimes in the fully-developed horse the *ulna* is as complete and well-formed as in the Pliocene horses.

Of all the many vestiges known to anatomists the slender splint-like bones so intimately related to the middle metacarpal and metatarsal (*canon*) bones of the horse are in many ways

¹ It is sometimes difficult to say whether a decided departure from the mean is of a progressive or a retrogressive nature—a sport or the result of atavism.

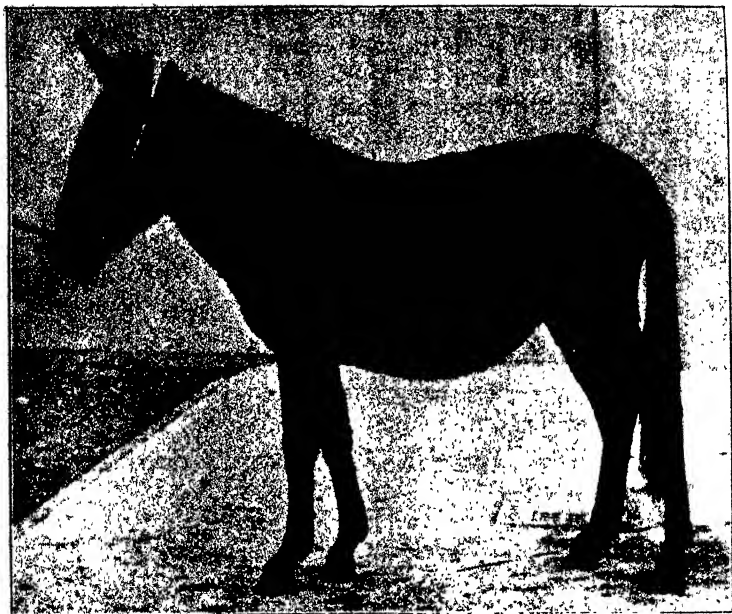


Fig. 39.—*A common mule.*

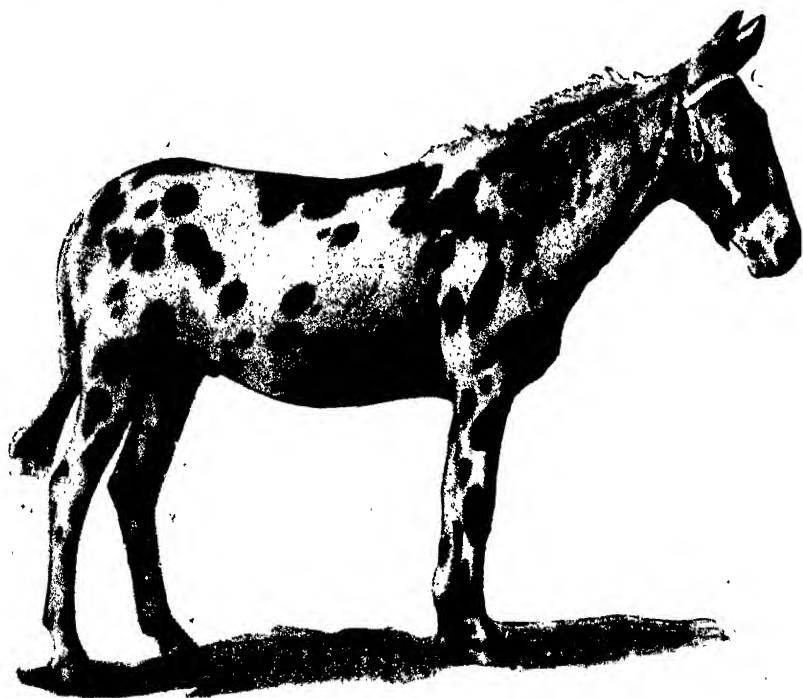


Fig. 40.—*A "painted" mule.*

the most interesting. After the appearance of the 'Origin of Species' in 1859, search was diligently made for evidence of descent with modification. When feeling ran high in the early 'Sixties, had it been possible to prove that the horse passed through a three-toed stage during its development, some of the doubters and waverers might have been "staggered."¹ This did not escape the notice of Huxley, but though assisted by Flower, he failed to find any vestiges of the digits corresponding to our index and ring fingers, our second and fourth toes. The vestiges were there all the same, but so masked and altered that they were unrecognisable. Hence we find Huxley, in his American lecture on Fossil Horses, stating the splint-like bones (second and fourth metacarpals and metatarsals) lying in contact with the canon-bones "bear no finger joints or, as they are termed, phalanges." In 1894, however, it was discovered that though there are no vestiges in the recent horse of the first and fifth toes, the phalanges of the second and fourth toes can easily be identified during development.² If the fore and ring fingers of man were kept in splints for a considerable time, the phalanges would unite and result in two stiff fingers. Very much the same thing happens in the developing horse. The phalanges of the second and fourth digits, never very distinct, coalesce to form stiff miniature toes. The joint (articulation) at the base of the second and fourth digits, however, persists for some time after birth, but this also eventually stiffens, and the minute rigid toes are hence permanently united with the splint-bones (*ι.e.*, with the slender but complete second and fourth canon-bones), to form what are familiarly known as the "buttons."

In the miniature second and fourth toes of the developing horse we have an imperfect restoration of the small but already quite useless second and fourth toes of *Protohippus*—*ι.e.*, we have a temporary reversion to the three-toed *Pliocene* ancestors.

Does it ever happen that the miniature side toes of the embryo horse, instead of degenerating into "buttons," continue to develop and grow until they are as large as the side toes in *Protohippus*, and in the still more familiar three-hoofed horse (*Hipparion*) so often unearthed from the *Pikermi* beds near Athens? Foals are certainly occasionally born with "extra" digits—sometimes an extra digit on the inner side of one or both fore limbs, less frequently on one or both hind limbs. I have several specimens showing extra digits, and similar specimens may be seen in museums. Some years ago a horse with extra digits was on exhibition in the United States, and another was

¹ Darwin often used this word when writing to Hooker and others about his theory of Natural Selection.

² J. C. Ewart, *Journ. of Anat. and Physiol.*, April 1894.

often on evidence in Camden Town, London. One of the digits I examined was practically identical with the inner (second) small digit in Hipparion. Another, though provided with a perfect hoof, more closely resembled a greatly enlarged "button"—*i.e.*, all the phalanges had coalesced. Have we in these extra digits an actual restoration of the small functionless toes of the Pliocene horses? This is a hard question, to which I am not yet prepared to give a definite answer. It is possible that under

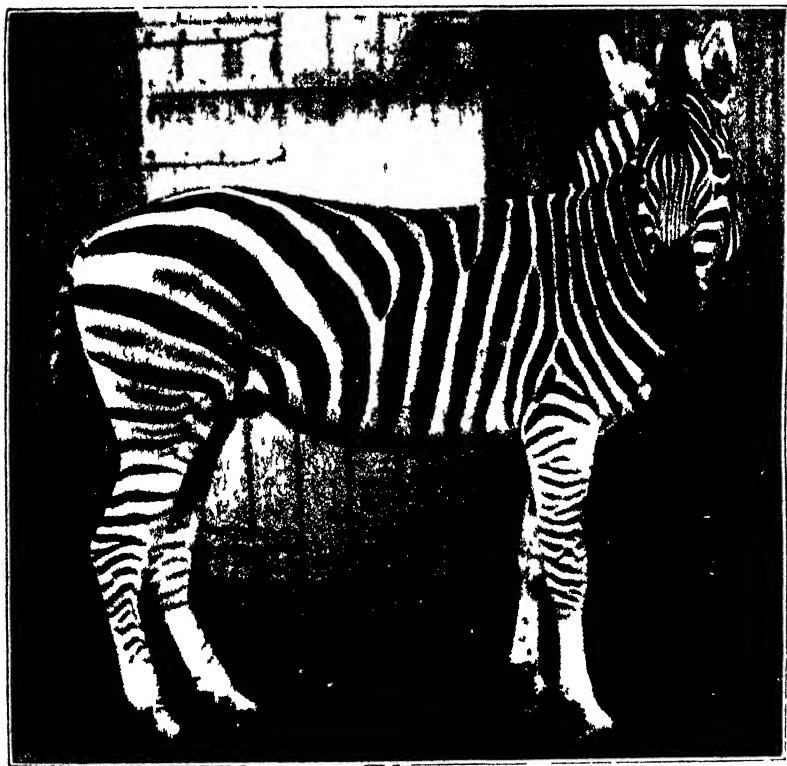


Fig. 11 —*Matopo, a Burchell zebra*

certain circumstances (*e.g.*, a plentiful supply of blood) miniature embryonic digits, instead of being arrested in their development, might continue to advance along the old ancestral lines, but it is also possible the extra digits are split off during development from the main or middle digit. Sometimes the hoof and all three phalanges (joints) of the large middle toe are split up in the horse so as to produce a cloven hoof, which mimics though it fails to reproduce the conditions in the ox. It is just possible that sometimes one of the halves of the split

middle toe develops more rapidly than the other, and thus gives rise to an extra toe, which resembles without being identical with one of the small side toes in the extinct three-hoofed ancestors. It will hence, in the meantime, be safer to leave unanswered the question, Have we in the extra digits sometimes present in the recent horse an instance of atavism—*i.e.*, reversion to a distantly related remote ancestor?

Though the rocks are able to enlighten us as to the progressive development of the brain, skeleton, and teeth of the ancestors of the horse, they must ever remain silent as to the coloration and as to the nature of the mane, tail, and chestnuts of the remote ancestors of the Equidæ. In the absence of fossil evidence it was once hoped something definite might be learned from "etchings" made by the Palæolithic cave-dwellers who so successfully hunted the horse during the Glacial period in the Rhone valley. But this source of information has so far failed. The same may be said of the representations made of the horse by the ancient Egyptians, and by the Greeks and Romans. The horse of antiquity is generally represented with a short upright mane, but as the tail has always long hairs right up to the root, and as a long wavy forelock is sometimes depicted, the mane in ancient as in recent times doubtless fell to one side and clung close to the neck. Again, it has been alleged the wild tarpan, once often met with to the north of the Sea of Azoff, and the wild horse (Prejevalsky's) of the Dzungaria and other deserts of Central Asia, are hogg-maned; but though in both the mane may be shorter than in more northern forms, it is certainly not erect, nor yet is the tail wanting in long hairs at the root.

If we turn from extinct and wild horses to horses living under domestication we find, as already stated, that more or less striped dun-coloured specimens occasionally appear in all parts of the world. Two years ago a pony from Tibet was described as being of a fawn colour, with a black dorsal band, stripes over the shoulders, flanks, and legs, and spots over the hind quarters; the tips of the ears and nose being black. I have seen several yellow duns with stripes on the forehead as well as quite a number of stripes on the neck, shoulders, and loins, and fragments of stripes rather than spots over the croup; sometimes there are white tufts extending into the mane, and three or four light rings at the root of the tail.

At the present day the plan of the striping varies to a surprising extent amongst the zebras, and there is further in the zebras a considerable difference in the ground colour. Seeing that the horse once ranged through the greater part of the Old and New Worlds, it is more than likely that it also varied greatly in its ground colour and to less extent in the plan of its

markings. Hence we are hardly justified in saying, as is sometimes done, that our horses have all sprung from fawn-coloured ancestors, and still less in attempting to indicate the arrangement of the ancestral stripes. It would be perhaps safer to say the ancestors of our various breeds of horses were richly

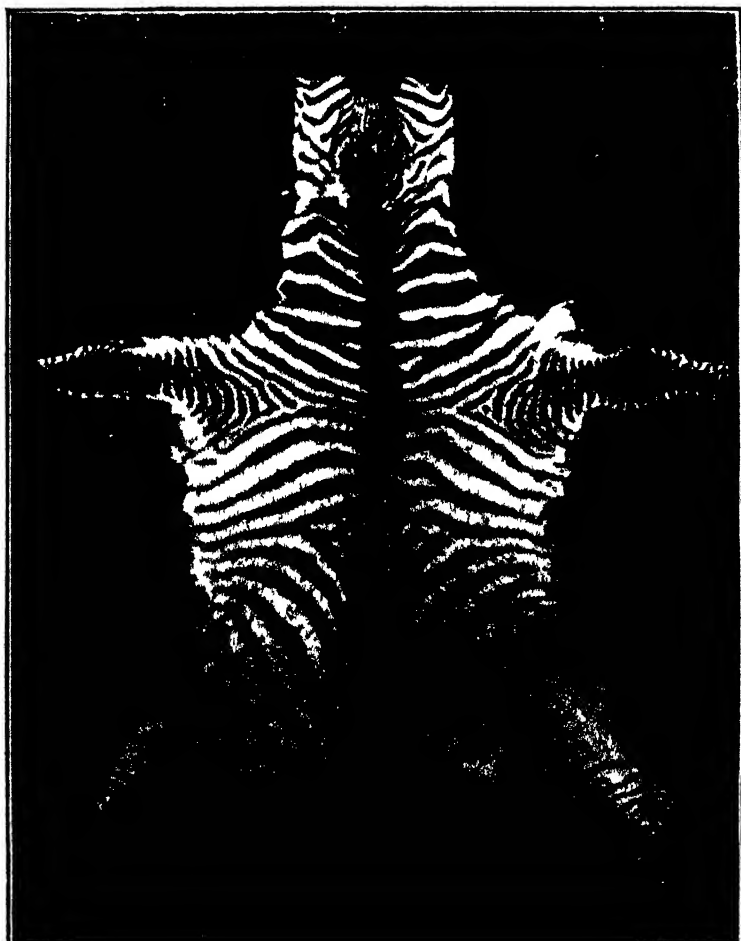


Fig. 42.—Skin of a young Burchell zebra, British East Africa.

decorated with stripes and bands, the body colour in some varieties being of a yellow-dun tint, in others a mouse-dun, while in others it was of a red- or leather-dun hue.

Judging by the facts already established, it may be taken for granted that when pronounced reversion occurs in the horse it

is likely to be indicated by a dark dorsal band, by distinct bars across the legs and several shoulder stripes, by fragments of stripes on the face, neck, trunk, and loins, the body colour being some shade of dun, the mane and tail and lower part of the legs darker, and the under surface of the body and inner surface of the legs paler than the rest. There may be, further, an incomplete light ring around the eye, light ear tips, and a light muzzle. In disposition a reverted horse may be expected to be characterised by a certain amount of what is sometimes, for want of a better name, called wildness—*i.e.*, increased intelligence and hardiness, an unusual interest in its surroundings, but considerable suspicion of unfamiliar objects and a dread of being separated from its companions.

It will be generally admitted that reversion is least likely to occur in high-caste Arabs and English thoroughbreds—in Arabs, because in Arabia there is a strong prejudice against duns; in thoroughbreds, because reversion (in as far as it implies “regression towards” mediocrity), though tending to hardiness and staying power, is almost certain to result in a loss of speed. No dun-coloured horse, it is said, has ever won the Derby.

But notwithstanding rigid elimination of duns, both in Arabs and English thoroughbreds, striped duns occasionally appear. A striped Arab filly of a reddish-dun colour (bred and presented by Mr Wilfrid Scawen Blunt of Crabbet Park, Sussex) is now in my possession. This filly (Fatimah), born in April 1898, has a dark dorsal band, distinct bars above and below the knees and hocks, and indistinct shoulder markings. The dam of this filly was a flea-bitten grey, the sire a chestnut. Of six of the ancestors of the dam two are white, one a flea-bitten grey, while three are bays. The dam of the sire (Mesaoud) was a flea-bitten grey, while his sire was a chestnut. Reversion is often said to be induced by intercrossing; but this can hardly account for the stripes in the high-caste filly Fatimah, for her chestnut sire (Mesaoud) is closely related to the white sire of her flea-bitten granddam. By her stripes Fatimah illustrates reversion, but in as far as she is a blend of her more immediate ancestors she illustrates regression. The offspring of black Arabs are more liable to be striped than the offspring of grey Arabs. This fact has long been recognised by continental breeders, and it was specially referred to in 1883 by Von Nathusius of Halle, long the greatest authority on the colour and structure of the hair of horses.

As an instance of reversion in a thoroughbred I may mention a filly by Friars Balsam out of Rose Bower by Retreat. This filly, a bay with black legs,¹ has a broad black dorsal band, several

¹ Bays with black points have, I believe, been formed by intercrossing light and dark duns—they are in a sense improved duns.

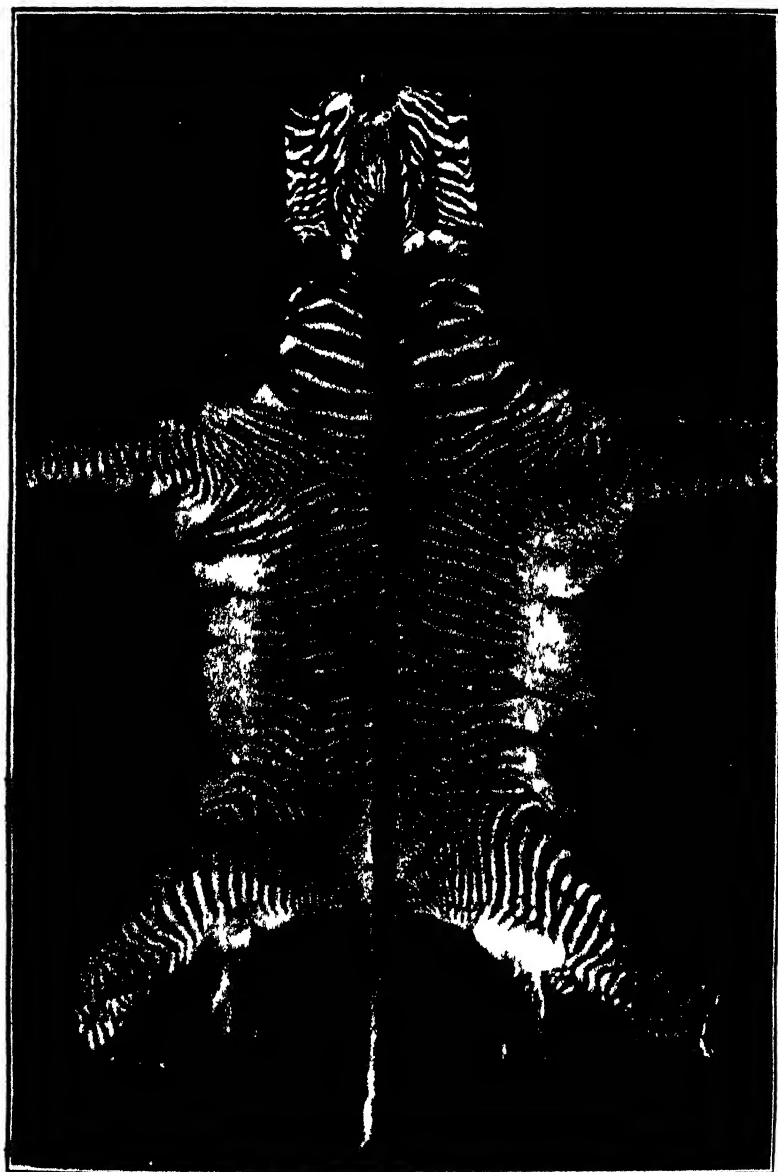


Fig. 43. -Skin of a young *Imperial zebra*, Somaliland

black bars above the "knees" and hocks, and faint black shoulder stripes.¹ If Arabs and thoroughbreds sometimes revert so as to resemble the striped dun-coloured ponies of Norway and other parts of Europe and the primitive breeds found among the Himalayas and in other isolated areas in the East, reversion is likely to be comparatively common in less well-bred stock, especially when it contains a trace of pony blood. As already mentioned, the descendants of the Spanish horses that became feral in the New World were frequently of a dun colour and partially striped. That horses are liable to revert to a dun colour is made apparent when different breeds or different colours of the same breed are intercrossed. Evidence of this is especially abundant in the west of Ireland, where yellow duns, with or without stripes, are still fairly common. Recently I saw three light yellow-dun foals, the offspring of bay and light-grey parents; a cream-coloured foal, the sire and dam of which were grey; and a light yellow dun (with a silver mane and tail as in the paternal grandmother), the sire of which was chestnut while the dam was a dappled yellow dun with dark mane and tail. Some of these yellow duns resembled ancestors several generations removed, the dun colour having in each case been latent in the grey parent or in a grey grandparent. I have also seen several dun-coloured foals by black sires. One of these foals, out of a black mare, was of a reddish-dun colour, with a dorsal band, leg bars, and three distinct stripes across the shoulder; another was a light yellow dun (with white mane and tail but quite devoid of stripes) out of a bay mare.

From the data already collected it seems (1) that light grey and black sires are more liable to get striped offspring than bay or chestnut sires—*i.e.*, stripes seem to be more often latent in greys and blacks than in bays or chestnuts; and (2) that about 80 per cent of the foals born may be said to be of a dun tint, frequently they are bay duns, less often they are reddish or brown duns. In many cases foals as they get older lose all resemblance of their immediate parents, and gradually acquire the exact colour, gait, and disposition of a grandparent or of a still more remote ancestor. While frequently illustrating the law of reversion, foals can seldom be said to illustrate in their coat colour Mr Galton's law of ancestral heredity. They,

¹ I am indebted to Mr J. Robertson, F.R.C.V.S., Queen Square, Lancaster, for information as to this filly. Mr Robertson thinks the filly's stripes came through Melbourne, a descendant of the Godolphin Arabian. In support of this view he mentions that the bay horse Titterstone (which was also striped) had two crosses of Melbourne. It is of course possible that Lord Oxford's dun Arabian is largely responsible for the stripes occasionally seen in thoroughbreds. Friars Balsam and his sire (Hermit) were of a chestnut colour, while of five other recent ancestors four were bays and one was brown. Rose Bower and five out of six of her recent ancestors were bays; the sixth (Hermit) was chestnut.



Fig. 44. — Matopo, a Burchell zebra.



Fig. 45. — Imperial zebra (*E. grevyi*).



Fig. 46. — Romulus, a hybrid by Matopo.

however, are often enough, both in flat races and across country, striking examples of "regression towards mediocrity."

About the relation of the African and Asiatic asses (there is no evidence wild asses were ever evolved in the New World)

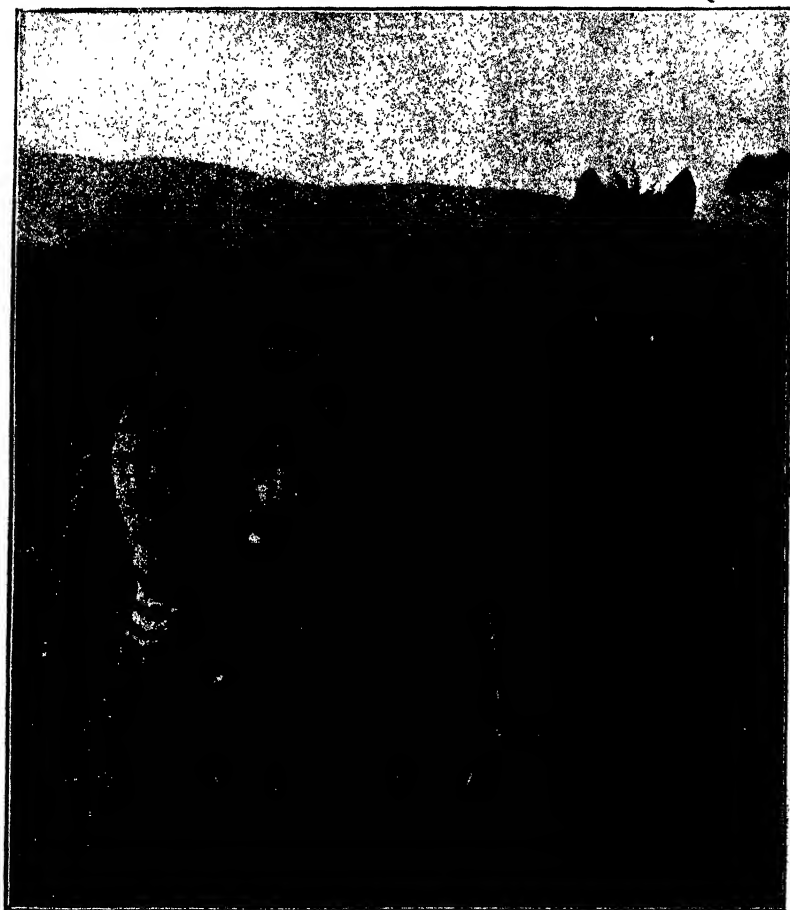


Fig. 47.—Hybrid between a Burchell zebra and a skewbald Iceland pony.

to the other Equidæ nothing is known. In some respects they present primitive characters, while in others they are highly specialised. They probably branched off from the main line at a remote period, some to be modified for an isolated life amongst the mountains, others to find a home in trackless deserts or on high plateaus. That they have come from richly

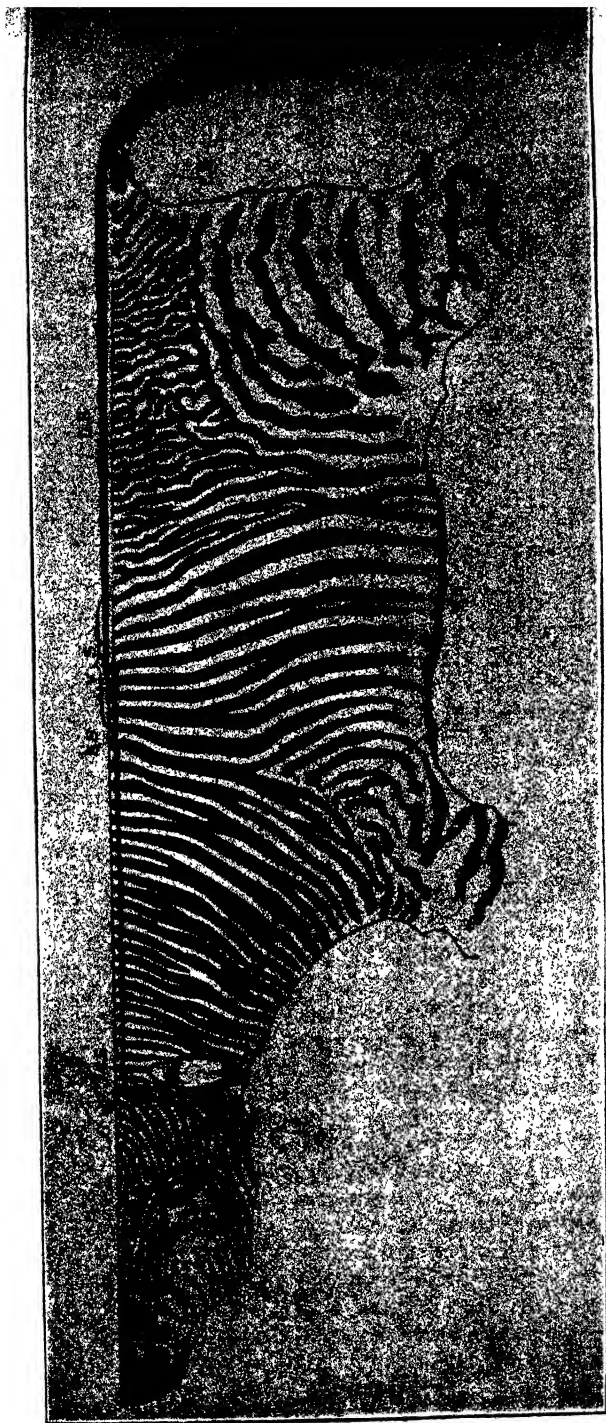


Fig. 48.—Diagram of stripes in *Ronulus*, a hybrid by the Burchell zebra Matopo.

I.C.S., First cervical stripe
V.B., Ventral band.

S.S., Shoulder stripe.
H.S., Humeral stripes.

V.S., Vertical stripes.
F.S., Femoral stripes.

D.B., Dorsal band.
F.t., Frontal tuft.

striped ancestors seems evident from, amongst other reasons, the occasional presence of bars on the legs and of extra stripes on the shoulders.

Quite as little is known of the origin of the zebras. They may be somewhat later offshoots than the asses from the main line, or they may form the main line, horses, asses, and certain extinct forms being offshoots. From the condition of the coat at birth it might almost be assumed the ancestors of the "gaily painted" zebras came originally from a cold country, and from the seasonal changes of the coat that it once counted for something being lighter, and hence under certain circumstances less conspicuous, during the winter. The foals of white-legged zebras are often barred almost to the hoof, doubtless because they have descended from richly striped ancestors. From the fact that the individual hairs in the asses and zebras are striped—in the horse the hairs are devoid of stripes—it might be argued that they branched off at or about the same time, but have ever since kept apart from the horse.

In the Equidæ, as in other mammals, crossing distinct varieties and species often leads to reversion. At one time it was hoped intercrossing, by inducing reversion, would restore lost links, and thus be the means of throwing light on the origin of both domestic and wild species. By intercrossing plants lost links are doubtless sometimes recovered, but neither intercrossing nor hybridising has hitherto helped much in restoring lost chapters in the history of mammals. This is due to the fact that reversion never leads to the complete restoration of remote mammalian ancestors. The crossing of varieties may fail to give even a hint of the species from which they sprung, while the crossing of species is never the means of restoring the characters of the genus to which they are directly related. On the contrary, cross-bred mammals sometimes exhibit the characters of both parents, and thus illustrate blended inheritance; at other times, by closely resembling one parent they illustrate exclusive inheritance; or by resembling in some points one set of ancestors and in other points another set of ancestors, they illustrate mixed inheritance.

That crossing distinct breeds does not necessarily lead to reversion is proved by the following cases: (1) A chestnut pony mare crossed by a grey Arab horse produced a colt which in make and colour is as nearly as possible intermediate between his parents. (2) A skewbald pony crossed by a bay Arab produced a skewbald foal almost the image of herself. (3) A nearly white Arab-like Irish pony produced to a bay hackney horse a nearly white pony, with the head, mane, and tail of an Arab type, but the trunk and hindquarters conforming to the hackney type. Though intercrossing frequently illus-

trates blended, exclusive, or mixed inheritance, it also frequently induces reversion—*e.g.*, a brown Highland pony produced to a bay Arab a mouse-dun colt with a dorsal band, stripes on the neck and withers, and numerous bars on the legs. Again, a bay mare produced to a bay thoroughbred a foal which at birth was a mixture of bay, mouse-grey, and yellow, and marked almost all over with narrow indistinct, dark stripes; the dam of this foal had descended from a dark-brown Flemish mare by a light Turcoman horse.¹

As almost every breeder of ponies and hunters can give numerous instances of reversion, I may without giving further examples proceed to consider what happens when horses, zebras, and asses are crossed. Ordinary mules and hinnies are frequently of a dun colour, and decorated by a dorsal band, several shoulder stripes, and numerous leg bars. In as far as such hybrids differ from their parents they illustrate reversion. But though mules and hinnies often wear the ancestral colours, and in their disposition display a certain amount of "wildness," there is little evidence that in their make they restore long-lost ancestors. In their make they take after their usually highly prepotent sire, or are a mixture of their immediate ancestors. If for countless generations the survival of the ass has largely depended on long, narrow, hard hoofs, powerful jaws, great endurance and intelligence, and long external ears, and if, further, the structures (old or new) which count most in the struggle for existence are most faithfully transmitted, we have little difficulty in understanding why mules, instead of being primitive in their characters, usually closely resemble their highly specialised parent.

That mules have wonderful endurance, live long, and, compared with horses, are easily maintained, results not so much from reversion as from their inheriting the characters of their sire and benefiting by the rejuvenating influence of intercrossing. Some of the mental peculiarities of mules are in all probability due to reversion, yet this can hardly be true of one of their most distinguishing traits—*viz.*, their want of initiative, so well illustrated in their dislike to act singly, and in their plodding on as long as they get a lead from a horse or other trusted companion.

Mules, like other hybrids, instead of illustrating reversion, occasionally serve as examples of exclusive inheritance. The mule represented in fig. 39, though out of a well-bred flea-bitten New Forest pony, closely resembles her sire, while the "calico" mule represented in fig. 40 is surprisingly like his dam, an Indian "painted" pony. In the "painted" mule the prepotency of the dam all but completely arrested retrogressive changes, and at

¹ Darwin, *Animals and Plants*, vol. i. p. 57.



Fig. 49.—*Diagram of stripes in Matopo, a Burchell zebra.*

S., First cervical stripe.
S., Stifle (knee) or lower flank stripe.

S.S., Shoulder stripe.
D.B., Dorsal band.

H.S., A humeral stripe.
V.B., Ventral band.

V.S., Vertical stripes.
n.p., Nostril patch.

G.F.S., Great flank stripe.
I.F.S., Intermediate flank stripe.

D.B., Frontal tuft.

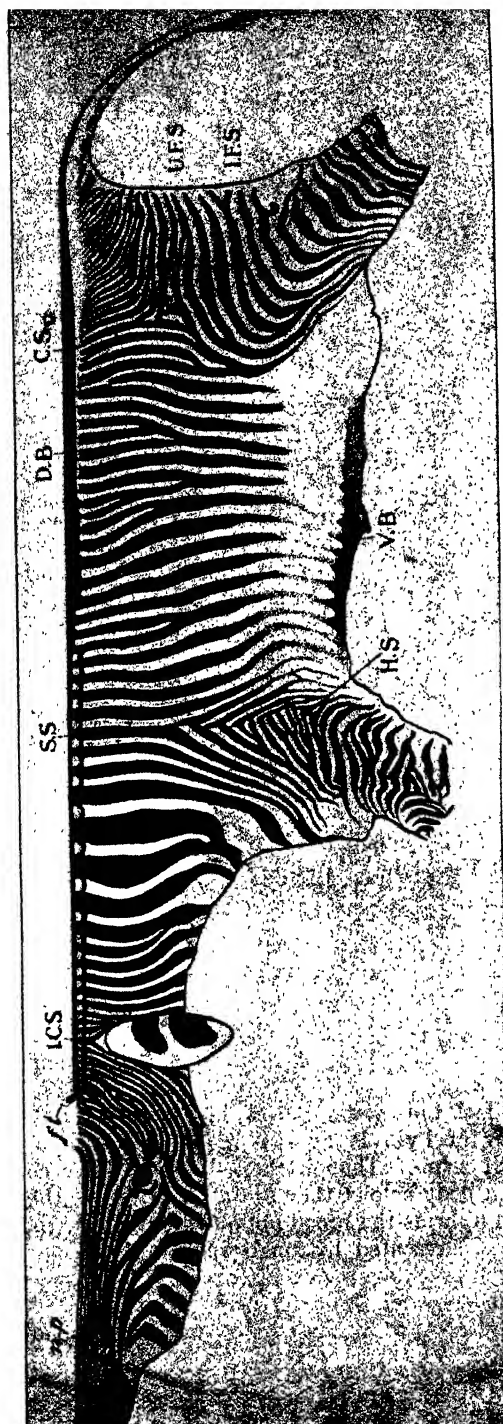


Fig. 50.—Diagram of stripes in an Imperial zebra.

I.C.S., First cervical stripe.
L.F.S., Lower femoral stripes.

S.S., Shoulder stripe.
D.B., Dorsal band.

H.S., A humeral stripe.
V.B., Ventral band.

U.F.S., Upper femoral stripe.
f.t., Frontal tuft.

the same time demonstrated that the jackass is not always more impressive than a mare. While we have usually in ordinary mules an imperfect blending of the immediate parents rather than reversion towards a remote ancestor, we have usually both in zebra-horse and zebra-ass hybrids a restoration of a number of ancestral characters. This points to the zebras occupying an intermediate position between horses and asses.

In the zebras, as in the asses, certain physical and mental traits are highly heritable. In some zebras, as in some asses, the size of the ears, form of the hoofs, and massiveness of the jaws appear to count for much, while curiosity, accompanied with extreme caution, wonderful alertness, and quickness, seem to be invaluable to others. These characteristics are often handed on almost unimpaired to zebra-horse hybrids; they are also, though to a less extent, often transmitted to zebra-ass hybrids. The less fixed characters of zebras, however, either blend with or are swamped by the corresponding characters in their horse and ass mates. In the case of zebra hybrids it is not until the plan of the stripes is studied that we find decided evidence of reversion. In the quagga (*E. quagga*) the legs were usually white, and no very distinct stripes occurred beyond the shoulders, while in the Imperial zebra (*E. grevyi*) the legs are barred to the hoofs, and stripes are especially numerous over the hindquarters.

It may be asked, Is the ancestral plan of decoration most faithfully preserved in the richly banded Imperial zebra or in the feebly and indistinctly striped quagga? That in the Imperial zebra of Somaliland we have the more ancient arrangement of the stripes, is supported by the fact that when stripes occur in foals they are often most numerous over the croup, and also because stripes or spots are occasionally seen over the hindquarters of yellow-dun ponies.

If the Imperial zebra approaches to the ancestral plan in the number and disposition of its stripes, it may be assumed that zebra hybrids which differ decidedly from their zebra parent will have reverted, if in their markings they resemble the Imperial zebra.

During the last four years Baron de Parana of Brazil has bred a number of hybrids by crossing mares with a white-legged Burchell zebra. Though these hybrids differ considerably in size and body colour, they are all "striped to the hoof." Further, in the hybrids the broad oblique stripes over the croup of the sire are represented by small spots.¹ I have obtained similar results by crossing mares of various breeds and colours by a zebra of the Chapman variety. This zebra, as fig. 41 shows, has the brow stripes converging to a point at the end of the

¹ The Field, December 1, 1900.

mane, the foreshank nearly white, few vertical stripes behind the shoulder, and great oblique bands across the loins and hind-quarters. The difference between the striping of a Burchell and an Imperial zebra is made at once evident by figs. 42, 43, 44, and 45. While in the Chapman variety of the Burchell zebra pointed arches decorate the brow, rounded arches prevail in the Imperial zebra. Again, while in the Chapman and certain other varieties there are but few transverse bands behind the shoulder, in the Imperial zebra there are over thirty transverse stripes between the withers and the root of the tail (figs. 42 and 43).

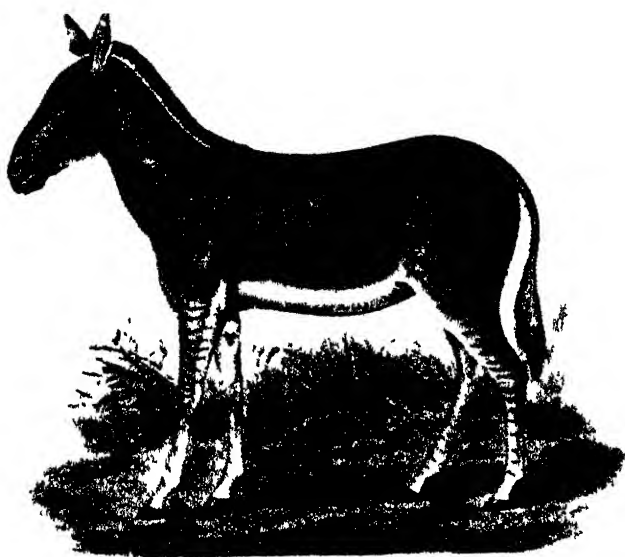


Fig. 51. *Burchell zebra and Hemion hybrid.*

All the hybrids I have bred by the zebra represented in fig. 41 approach in their markings the Imperial zebra. That these hybrids are sometimes richly and distinctly striped fig. 47 makes sufficiently evident, and that in their markings the hybrids differ from their zebra sire and resemble the Imperial zebra will be gathered by comparing figs. 46 and 48 with figs. 44, 45, 49, and 50, which represent the plan of the markings in the hybrid Romulus, his sire Matopo, and also in the Imperial zebra. Sometimes in zebra hybrids spots take the place of stripes over the croup. In zebra-horse hybrids the spots, distinct enough at birth, usually unite to form zig-zag bands, but in some zebra-ass hybrids the spots persist

throughout life. Fig. 51 represents a zebra-ass hybrid with spots over the croup and part of the hindquarters, and it also shows that, while the bars on the legs are quite distinct, the markings on the neck, shoulder, and trunk are numerous and ill-defined, and quite different from the stripes of any of the living zebras.

I hope to conclude this paper in a future volume of the 'Transactions.'

THE CONVERSION OF HOME-GROWN TIMBER FOR ESTATE AND OTHER PURPOSES.

By D. F. MACKENZIE, F.S.I., Morton Hall, Liberton.

IN order to help to make "ends meet," and if possible overlap, every advantage should be taken of the natural capabilities of any and every industry on landed property that can be carried on with profit, and few things can be made more profitable, comparatively, on a large or small estate than the manufacturing of the timber by the proprietor. Owners and managers of landed property are too well aware of the great quantity of timber constantly required for maintaining the property in good repair, and of the many wants of tenants, to need to be told that sawn timbers of all kinds are constantly in demand. Tenants are often well pleased to be able to buy manufactured timber for repairs from the proprietor, expecting as they naturally do to get it considerably cheaper from the proprietor than from the timber merchant or other middleman.

On many properties a very considerable trade is carried on in the manufacture and sale of timber, and in nine cases out of ten the trade proves a profitable one both to the owner and the small purchaser. On one of the estates managed by the writer nearly all the timber is manufactured for estate purposes, and supplying the tenants and others in the district with timber at comparatively low, but quite remunerative, prices. This is a boon to the purchasers and a considerable profit to the landlord, and the work is done by the same workmen as do the forestry and other estate work, being usually carried on by them during bad weather. Notwithstanding the fact that it is remunerative as a branch of forestry, the manufacturing of timber is seldom practised, or treated as it deserves to be

treated, by the producers of timber. It is, as it were, the harvesting of the crops planted, perhaps by past generations.

The manufacturing or conversion of timber is indeed an important branch of forestry (the writer thinks it is of the greatest importance to the producer), yet there is no branch of his work more neglected or about which less is known by the average forester than the commercial aspect of timber manufacture. The lack of such knowledge may not be the fault of the individual forester, but rather owing to the fact that such a branch of learning is not encouraged by the average landowner, either by additional emoluments or by recognising it as a qualification. He prefers to sell his timber either standing or lotted, probably at a sacrifice, rather than trouble with the manufacture and sale, even if the trees are lying rotting by thousands in his woods.

Some landowners would no doubt now manufacture their own timber if the men with the necessary knowledge were to be found. The knowledge must be begotten of experience. I think it may be asserted as a truth beyond dispute, that it is quite impossible to become proficient in the art of converting timber unless the person knows exactly what are the best methods, machinery, the proper size of the various classes of wood he has to cut, the cost of cutting the same, and the markets in which he can effect sales.

As in most other industries, the methods and markets in the timber trade have changed considerably during the last twenty-five years. The prices ruling twenty-five years ago for both goods and labour are not to be thought of at the present day. The wages are at least 20 per cent higher than then, while the workman does considerably less work in a given time, so that the difference on the first cost may be put down at about 30 per cent more at the present time than at the former period. Therefore, although the prices of manufactured timber are not much reduced, if any, the timber merchant is unable to give the prices of the former period, simply because of the higher wages and lesser output of work by the workmen. This necessarily reflects prejudicially upon the interests of the producer, and, moreover, when he buys manufactured timber for his own wants, he has to pay an enhanced value, thereby losing at both ends as it were; whereas if he manufactured his own timber, even if only sufficient for his own requirements and those of his tenants, he would save whatever profits the middleman may have. In short, where the manufacture of timber is carried on in a practical manner by the producer, a profit of from 20 to 50 per cent is generally made on the raw material. This alone should be a sufficient inducement to the landowner to manufacture his own timber, without taking into account the con-

venience of having proper men and machinery at hand when large numbers of trees are blown down.

The writer having had long experience in the conversion of timber, and in supplying both local and distant markets, will give below some details which may be of considerable use to those not very familiar with the work.

The most important points to be noticed are the sizes, uses, and cost of cutting up the various classes of timber grown for profit in Britain, and also the machinery on a limited scale best adapted for the purpose.

The machinery should be of a portable type, and the motive

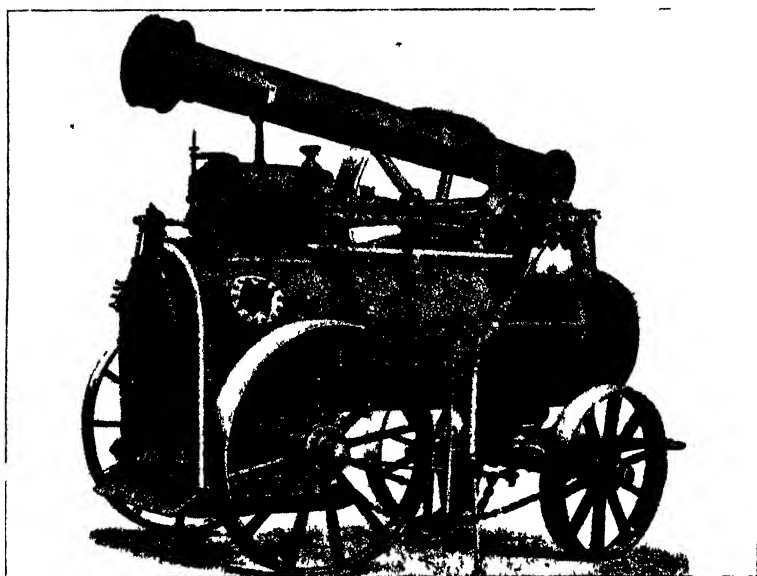


Fig 52 - *Portable engine.*

power a 10 or 12 horse-power engine (fig. 52) with high-pressure steam-boiler, the furnace to be so constructed as to permit of the steam being generated by the burning of the waste from the sawmill, such as slabs and the like. Where, however, there is a fair demand for such waste, it might be found more economical to use an oil-engine of the same power. Even if there were no demand for such waste product, the oil-engine might be the more economical of the two, as the wages for tending would be almost nil.

With varying results, according to the circumstances of each individual case, traction engines (fig. 53) are often used as the motive power for the sawing and haulage of the rough and sawn

timber. It has been proved that this class of motive power is not generally so useful for work in rough woodlands as at first sight it would seem to be, except where such may be used as a steam-roller, and for the breaking of whinstone for road-making, general estate operations, and concrete works. Under these latter circumstances, and, it might be added, where a portable threshing-mill is in use or required, this class of power will be found the most useful; but when these requirements are absent, where the quantity of timber is limited, and the distance for cartage is under five miles, it is less satisfactory than horses for transport of rough timber to the sawmill. The wages and upkeep of the traction engine under ordinary circumstances are

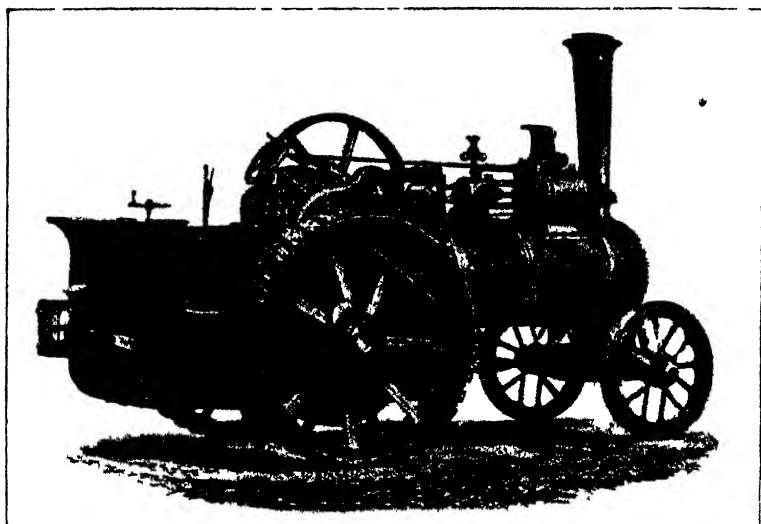


Fig. 53 — *Traction engine.*

also greater. On the highway, however, it is possible to convey the manufactured timber cheaper by the traction engine, provided the distances are long. In such cases the saving by this power compared with that of horses varies from 5 to 20 per cent.

The principle of the motor car may in time be an improvement on the traction engine, especially where the quantities are limited. Where the situation is such as will permit of rails being laid down without much excavation, tramways, whether worked by horse, steam, or cable power, are to be recommended both on account of their efficiency and cheapness. A cable may, if the distance be under half a mile, be worked by the same power as drives the saws, and may be

used for dragging the rough wood to the mill in the same way as it is done by horses. The cable may be got to draw wood from any direction by the application of the system of anchor pulleys, one of which is fixed at each angle along the line the logs are to be drawn to the sawmill. The ordinary contractor's tramway plant is recommended as being most efficient and cheapest, especially when used for a number of years. The gauge may be narrow or wide as may best suit the circumstances. The rails should not weigh less than 10 lb. to the foot, and should be self-fixing.

Like other commodities, the cost of engines of the same power, whether for steam, gas, oil, or electricity, differs widely, according to the difference in the quality of material used in their construction and finish. That because A supplies an engine of a given horse-power so much cheaper than B, it does not therefore follow that B does not give value for the difference in price, for the difference may be represented by the better quality of the materials used and also by better finish.

A 12-horse-power portable engine fitted on a multitubular boiler, with saw-benches, saws, and belting, also motion-drum for raising the speed, together with a proper shed or housing for mill, would cost about £330. Taking the average outlay of ten years, the upkeep of such plant, including interest on capital, tear and wear, insurance, saws, oils, files, and wages to a capable man as tender, would cost £160 per year. An oil-engine and plant would cost 20 per cent less, and where a sufficient supply of water is not obtainable for a steam-engine, these oil-engines are to be recommended, very little water being required. A traction engine (as in fig. 53) would cost from £500 to £560.

An engine of 12 brake-horse-power is capable of driving four

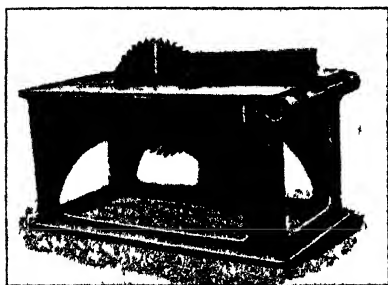


Fig. 54 — *Ripping-saw bench.*

circular saws, three of which would be "ripping" saws and one a "cross-cut." The latter could be fitted into a short metal bench or table fitted either "dead" or movable on rollers, but so as to be easily converted into a ripping-saw bench at pleasure (fig. 54). This bench may be parallel to the "long bench"—a bench fitted for cutting up long timber (figs. 55 and 58).

Both cross-cut and ripping saw of long bench may be driven off the same shaft, the shaft to be of such a length as to

permit of short pit-wood and fence-stobs being cut from long small timber if required, and to have bearings in the centre to prevent vibration, the shaft being fitted with fast and loose pulleys (fig. 56).

The other two ripping saws may be fitted into two short or other benches, as is convenient, made suitable for cutting up



Fig. 55.—Saw bench for staves and pit wood.

pit-wood, stobs, barrel-staves, heading and box wood. Both may be on one shaft, with fast and loose pulleys like the other, and all driven from a 5-foot diameter speed-raising drum, which is driven direct from the engine fly-wheel by a 7-inch five-ply rubber and cotton belt, wider or narrower according to the power of the engine, but of sufficient weight to prevent slipping without being unduly tight, and to secure the steady speed of the saws.

The benches may be very elaborate or very simple. The simple forms are capable of producing the very best work.

Fig. 57 shows an ordinary sawmill built and worked upon commercial principles. It consists of two long benches, two short ones, and a cross-cut saw bench, all driven by a 12-horse-power portable engine of the type of fig. 52, with the speed-raising drum placed in the roof in the centre of the mill-shed. The engine should stand at the side of the benches, near one end.



Fig. 56.—Shaft for driving saw.

The benches are formed of Scots fir of the following specification: Top rails, 8 inches by 3 inches; cross-pieces, 7 inches by 3 inches; bottom rails, 5 inches by $2\frac{1}{2}$ inches; uprights, 6 inches by $2\frac{1}{2}$ inches; rollers for moving table, 7 inches diameter, with iron spindles set at 3 feet apart, centre to centre—the rollers to have grooves to suit the “rack” and “feather” of movable top or table.

The table may be propelled by hand-pinion, or direct from the speed-drum or saw shafting. Generally speaking, the hand motion is preferable for many reasons. Fig. 58 shows benches of this type.

As an indication of the power necessary to do a certain amount of work, the following examples may be found useful. The power required to cut a log of pinewood 32 inches deep by



Fig. 57. — Sawmill.

a circular saw 72 inches in diameter, and revolving at a speed of 500 revolutions per minute, is found, in practice, to be about 10 brake-horse-power, the same as is required to drive four 40-inch saws, each cutting a log 8 inches deep. A 60-inch saw, driven at a velocity of 600, cutting a log 26 inches deep, requires 7 horse-power. A 48-inch saw, revolving at a velocity of 800, cutting a log 20 inches deep, would require 4 horse-power; and a 42-inch saw, revolving at a speed of 900 per minute, cutting a log 18 inches deep, would require 3 horse-power.

It will be observed that the speed at which the saw is driven is a considerable factor. Saws of a less diameter, and proportionately thinner, require comparatively less power so long as the speed is high and the log is not deeper than the saw.

The greater the diameter of a saw the slower the speed should be. A saw of 24 inches to 30 inches in diameter could safely be driven at a speed of 1500 revolutions per minute, but a 72-inch saw would go to pieces at such a speed. There should be two saws for each bench or table, each of a different thickness and diameter. The cross-cut saw should be 3 feet 6 inches in diameter, and No. 12, B.W.G. The saws for the long bench for cutting deals, joisting, and suchlike, should also be 3 feet 6 inches diameter, No. 13 "slack" for squaring or slabbing, and No. 15 "tight" for ripping. The others should be 3 feet in diameter, and one saw, the slabbing one, should be No. 14 or 15, and the ripping one No. 16 "tight," B.W.G. The second set should have small and "close-pitch" teeth for cutting hardwoods.

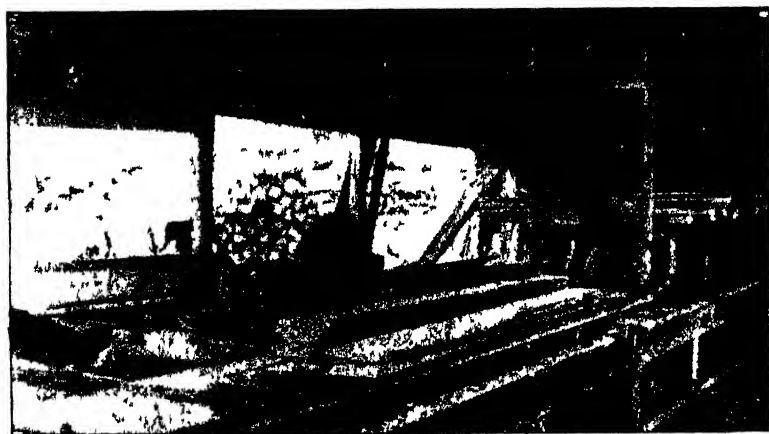


Fig. 58.—Long saw benches.

It would be of great utility to have a band-saw attached to work at pleasure, and for the purpose of cutting out felloes and other irregular-sided timbers.

* The quality of saws is important. They should be of the very best cast-steel plates, and of a thickness suitable for the various benches, keeping in view the work each has to do. If the blades are too thick, there is a ruinous waste of timber in sawdust; if too thin, there is also a waste, but of a different kind, that of unequal thicknesses. Thin saws are, in the hands of an inexperienced workman, most difficult to manage. The slightest fault in the trimming causes loss of time and timber. While that is the case, thick saws also cause a very serious loss in timber, and consequently in money.

The shape and pitch of the teeth of saws are also very im-

portant. The teeth of the cross-cut saw should have no "hook," and should be shaped to a broad bevel like a spear-point. The pitch or distance of the points of the teeth apart may be from $1\frac{1}{2}$ to 2 inches. All the other saws should be sharpened to a chisel-like point, with very little bevel. The pitch of the teeth of the larger saws should be from 2 to $2\frac{1}{2}$ inches, and those of the lesser ones from $1\frac{3}{4}$ to $2\frac{1}{4}$ inches.

The saws for cutting hard dry woods may with advantage be $\frac{1}{4}$ inch less in pitch and slightly less in hook. The hook is best indicated by drawing a line from the point of the tooth through the centre of the spindle-hole in the centre of the saw. The face of the saw-tooth should be at an angle of from 20° to 30° to that line (fig. 59). It is of great importance that the points of the teeth are absolutely the same length from the centre of the saw. To ensure this the points of the teeth are frequently

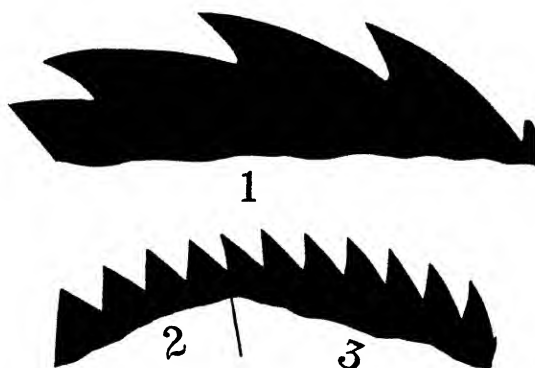


Fig. 59.—Teeth of saws.

"stripped." This is done by holding a piece of hard sandstone against the points of the teeth, keeping the saw revolving at about half-speed during the operation. The teeth should then be sharpened up to the face-point—*i.e.*, all trace of stripping should be removed from each tooth, but nothing more. The blades of saws should at all times be kept at a uniform tension throughout. The uniformity of tension is sometimes destroyed in the centre by continual or frequent heating of the saw-spindle, thus causing the saw to go into the form of a shallow cup. In the outer rim the tension is disturbed by insufficient "set," by being frequently jammed by the vice action of dried or twisted logs, by bad trimming, and by having the guides too tight, all of which tend to expand the outer edge of the saw, twisting it, and thereby causing it to cut up the logs in an erratic manner.

The cost of saws varies with the thickness, diameter, and quality of the plate. They are usually sold at so much per

inch, measuring across their diameter to the points of the teeth. The catalogue prices seldom alter, but the discounts, which often exceed 50 per cent of the catalogue price, vary with every change in the cost of raw material and labour. A 42-inch circular saw, gauge 10, costs from 72s. to 75s., while it is catalogued at 180s. A 36-inch saw, gauge 11, costs 44s., while it is catalogued at 120s. Thinner saws are cheaper in proportion.

The usual thickness of saws in use in sawmills worked by landed proprietors is between 10 and 12 B.W.G., even when of small diameter. This is because they are more rigid, and do not reflect bad trimming so readily. The proper thickness should be from 13 to 16 B.W.G. Let me give an example to illustrate what the difference would be. Two men are required to cut, say, 4000 superficial feet of 1-inch larch boarding. The one works gauge No. 16 and the other gauge 12. To produce 4000 superficial feet with the No. 16 saw 366 feet of rough timber is required, while the man working the No. 12 requires a little over 20 feet more—viz., 386½ cubic feet—being a loss of timber alone of about 6 per cent, or 20s. 6d.; then cartage of extra timber at 1d. per cubic foot, 1s. 8½d.; cross-cutting at ½d., say, 10d.; three hours more of man and machinery at 2s., equal 6s.—in all, say, a difference of 29s. on that small quantity of wood. In other words, a very handsome profit is converted into sawdust. Any one can make the calculation for himself, and he will find that the above figures are practically correct. It is to be regretted that this is so much overlooked by those in charge of estates where timber is manufactured for estate purposes.

The machinery should be placed as near as possible to where the timber to be cut lies, so as to save the cost of long cartage; but having due regard to the seasoning and removal of the cut timber. This is of the utmost importance, because of the great difference in weight between manufactured seasoned timber and the rough wood from the trees. Let us take a few examples. It takes only from 30 to 32 cubic feet of young rapidly-grown larch in the green rough state, including the bark, to weigh a ton, whereas it takes from 70 to 80 feet to a ton of the same wood when cut up and seasoned; old matured larch, green, 32 to 34 cubic feet per ton—in the cut up and seasoned state 56 to 70 cubic feet; young and rapidly-grown Scots fir from 26 to 28 cubic feet to the ton, the same cut up and seasoned 72 to 80 cubic feet; old well-matured Scots fir 28 to 30 cubic feet to the ton, in the manufactured state 52 to 68 cubic feet; young fast-grown Norway spruce, green, 29 to 31 cubic feet to a ton, and when sawn up and seasoned 80 to 86 cubic feet; old mature spruce, green, 32 to 35 cubic feet to a ton, and when sawn up

and seasoned and in the manufactured state 70 to 80 cubic feet.

The average weight of bark in a ton of pinewood is found to vary from $1\frac{1}{2}$ to $2\frac{1}{4}$ cwt., or in other words, the actual quantity of wood in a ton of rough trees or timber ranges from $17\frac{1}{2}$ to $18\frac{1}{2}$ cwt. Taking into account the large proportion of moisture and the weight of bark, it is not difficult to decide which method is best—i.e., either carting rough timber long distances, after which it is transported equally long distances by rail, or manufacturing it on the spot, either by the producer or the middleman. It is no exaggeration to say that the cost of such transport is often twice the amount of the purchase price.

The expense of manufacture is governed by the distance the rough wood has to be carted as well as by the rate of wages and the capability of the workmen employed, and also by the quantity, quality, and position of the growing timber. There can, therefore, be no absolute rule laid down to guide one; but the following are some of the writer's contract prices. If we assume that the sawmill is situated at an average distance, not more than a mile and a half from the timber to be manufactured, the cost of carting should be $\frac{3}{4}$ d. per cubic foot, including bark. For felling and cross-cutting into lengths, no length to be under 6 feet, Scots fir and larch $\frac{1}{2}$ d., spruce $\frac{3}{4}$ d. to 1d. per cubic foot; for hardwoods, 1d. to 2d. per cubic foot. The cost of sawing and stacking to season (exclusive of motive power), from $1\frac{1}{4}$ d. to $1\frac{1}{2}$ d. per cubic foot—say, 4s. per 1000 superficial feet of $\frac{3}{8}$ -inch thick, to 7s. 6d. per 1000 superficial feet of 1-inch boarding. To be more specific, however, when the timber to be manufactured consists of thinnings, prunings, and scattered lots, the following details will be of considerably more service than general assertions and averages, no matter how exact these may be.

The uses to which the various woods found growing in this country are generally put are well known; but it would suit the present purpose better to give the full details of the leading kinds, with the prices of manufacture which are being paid at the present time. The sizes given are what are generally called stock sizes.

Cartwright Wood.

Rollers: Ash or elm, 54-inch wheels, $4'' \times 3\frac{1}{2}''$, at $\frac{3}{4}$ d. each; 54-inch wheels, $3\frac{1}{4}'' \times 5''$, at 1d. each. *Spokes*: Oak, $28'' \times 3\frac{3}{4}'' \times 1\frac{1}{2}''$, at 3s. 6d. per 100; $28'' \times 4'' \times 2''$, at 4s. 3d. per 100. *Naves*: Elm, $12'' \times 12''$ to $14''$ diameter, 8s. 4d. per 100. *Shafts or "trams"*: Ash, elm, or oak, $13' \times 6'' \times 4''$, 1s. per pair; $14' \times 7'' \times 4''$, 1s. per pair; larch, same sizes and same price. *Cart-sides*: Larch, $6' 6'' \times 12'' \times 1\frac{1}{2}''$, 2d. per cubic foot; beech, $6' 6'' \times 12'' \times 1\frac{1}{2}''$, 2d. per cubic foot. *Bottoming*: Larch, $6' 6'' \times 2' 9'' \times$

1½", 2d. per cubic foot; willow and poplar, same sizes and same price. "*Cods*": Beech, 2' 6" and 3' x 6" x 4"; 2' 6" and 3' x 7" x 4", and 6' 3" x 9" x 4", all 2d. per cubic foot. Oak *slots*, 3' 8" x 5" to 8" x 1½", at 6s. 3d. per 100 pieces.

Van Wood.

Felloes: Ash or elm, 54" wheels, 3" x 3", 2d. per cubic foot; 54" wheels, 2½" x 2½", 2d. per cubic foot. *Spokes*: Oak, 28" x 2½" x 1½", 2s. 6d. per 100; 28" x 3" x 1½", 2s. 6d. per 100. *Naves*: Elm, 11" x 10" to 11" diameter, 4s. 2d. per 100. *Shafts or "trams"*: Ash, elm, or oak, 12' x 2½" x 3", 2d. per cubic foot. *Sides*: Larch, 6' 6" x 14" x ¾", 1½d. per cubic foot. *Slots*: Oak, 3' 9" x 4" to 5" x 1½", 6s. 3d. per 100. *Bottoming*: Larch, 6' 6" x 3" x ¾", 1½d. per cubic foot.

Lorry Wood.

Felloes: Ash or elm, 36" to 39" wheels, 3" to 3½" x 3½", 3s. per 100. *Spokes*: Oak, 18" to 20" x 3½" x 1½", 2s. per 100. *Naves*: Elm, 9" to 11" diameter, 4s. 2d. per 100. *Shafts or "trams"*: Ash, elm, or oak, 9' x 2½" x 2½" to 3½" x 3½", 2½d. per cubic foot. *Bottoming*: Larch, willow, or poplar, 13' x 6" x 1" and 14' x 6" x 1", 1½d. per cubic foot. *Framing*: Ash, elm, or oak various sizes, 2" x 1½" to 4" x 2" and 4" x 1½", 2d. per cubic foot. *Awl-blocks*: Elm, 4' to 4' 6" x 4½" to 6" x 6", 2d. per cubic foot.

Coach Wood.

Felloes: Ash, 38" wheel, 2½" x 2½", 3s. per 100; 46" wheels, 2½" x 2½", 3s. 6d. per 100. *Naves*: Elm, 10" x 7" to 9" diameter, 4s. 2d. per 100. *Spokes*: Oak, 28" x 2½" x 1½" and 28" x 2½" x 1½", 2s. 6d. per 100. *Shafts*: Ash, 9' x 2" x 1½", 2½d. per cubic foot. Various small sizes of framing cut from planks of ash or elm ¾" to 1½" thick, 2d. per cubic foot. *Cladding and panelling*: Elm, ash, maple, walnut, willow, and poplar, 2d. per cubic foot.

Barrow Wood.

Shafts or "trams": 5' 6" x 3½" x 1½", ash or elm, 3d. per pair. *Flet and nugs*: Ash, elm, or oak, 1d. per set. *Slots*: Ash, elm, or oak, 18" x 3" x 1½", 2d. per dozen. *Felloes* for 18" to 20" wheels, 2" x 2", 2d. per dozen. *Spokes*: 18" x 3" x 1½", 2s. per 100. *Naves*. 9" x 4" diameter, 6d. per dozen. *Cladding*: Willow, poplar, or fir, ¾" thick, 6s. 6d. per 1000.

Waggon Wood.

Beams: Oak, $18' \times 12' \times 4\frac{1}{2}"$ and $5"$, and up to $18' \times 12' \times 12"$, at 2d. per cubic foot. *Small scantlings and cleadings*: Oak, $2"$ thick, 2d. per cubic foot.

Timber for General Purposes.

All hardwoods are usually cut into scantlings and planks of various thicknesses at 2d. per cubic foot. Small clean oak cut into *railway "keys"*: North British Railway sizes, $7" \times 2\frac{5}{8}" \times 1\frac{1}{8}"$, 7s. 6d. per 1000; Caledonian Railway sizes, $7" \times 2\frac{1}{2}" \times 2\frac{1}{8}"$, 7s. 6d. per 1000. *Railway waggon sprags*: Oak, usually from small sizes, $3' \times 4\frac{1}{2}"$ to $5"$ in diameter—these are, of course, pointed bluntly at each end like a fence post,—8s. 4d. per 100.

Carpenters' wages: Beech, plane, maple, and various other woods, $15" \times 3\frac{1}{2}" \times 2"$, tapered to $\frac{1}{8}"$, 1s. per gross.

Scots fir: Half-inch boarding, 4s. 6d. per 1000 superficial feet; $\frac{5}{8}"$, 5s. 6d.; $\frac{3}{4}"$, 6s. 6d.; $\frac{7}{8}"$, 7s.; and $1"$, 7s. 6d. per 1000 superficial feet. *Barrel staves*: $26"$ to $31" \times 2\frac{1}{2}"$ to $4\frac{1}{2}" \times \frac{1}{2}"$ and $\frac{3}{8}"$, 4s. 3d. per 1000 superficial feet. *Barrel ends*: $18" \times 4"$ to $8" \times \frac{5}{8}"$ to $\frac{7}{8}"$, 4s. 9d. to 5s. per 1000 superficial feet. Hardwood staves of same sizes from 5s. to 5s. 6d. per 1000 superficial feet.

Spruce and Scots fir, and any kind of wood made into *pit sleepers*, $3' 6"$ and $3' 9" \times 5" \times 2"$, 2s. per 100 pieces. *Pillar wood* for underground works, same class of wood, and usually tops and branches of hardwood trees, $2'$ to $3' \times 3"$ square, up to and including $6"$ square or round, 1s. 3d. to 2s. per ton.

Larch. Railway sleepers: $7' \times 7" \times 3\frac{1}{2}"$, 5s. 6d. per 100; $8' \times 8" \times 4"$, 7s. 6d. per 100; $9' \times 9" \times 4\frac{1}{2}"$ and $9' \times 10" \times 5"$, with $5"$ square slab on back, 8s. 4d. to 10s. per 100. Scots fir sleepers are cut same sizes and at same prices.

Larch. Boat "skin" or cladding: Any lengths $\frac{3}{8}"$ to $2"$ thick, 4s. 6d. to 14s. 6d. per 1000 superficial feet.

Larch. Fencing wood: Stobs, railway sizes, $4' 6" \times 3\frac{1}{2}"$, 2s. 8d.; $5'$ and $5\frac{1}{2}' \times 3\frac{1}{2}"$ and $4"$, 3s. 8d.; $6' \times 4" \times 4"$, or wood equal to that, 4s. 2d.; and $6' \times 6" \times 3"$, 4s. 8d. per 100. *Larch rails*: $3" \times 1"$ and $3" \times 1\frac{1}{4}"$, 7s. 6d. per 1000 lineal feet. Scots fir rails of same sizes, same price. Split and quartered pit-wood of any wood ranges in lengths from $18"$ to $4' 6"$ sawn from sizes of $5\frac{1}{2}"$ to $8"$ diameter. *Larch mining timber*: English markets in the round state ranges from $12' \times 5\frac{1}{2}"$ to $15' \times 8"$ —*e.g.*, $12'$, $13'$, $14'$, and $15'$ lengths. For Scotch mining timber the sizes used are from $3"$ to $5"$ diameter of various lengths ranging from $5'$ to $25'$.

Spinning-mill rollers: Plane, 7" to 9" \times 1 $\frac{3}{4}$ ", 3s. 6d. per gross.
Malt-barn scoops: Plane, 14", 16", and 23" broad, $\frac{7}{8}$ " to $\frac{3}{8}$ ", 8d. per dozen.

Golf-club heads to pattern, 3d. per dozen.

Beetling beams: 5' 9" \times 4 $\frac{1}{2}$ " \times 4 $\frac{1}{2}$ ", 2d. per cubic foot.

Shuttle blocks: Hardwoods, 22" \times 2 $\frac{1}{2}$ " \times 2 $\frac{1}{4}$ ", 1s. 9d. per 100.

The foregoing are the sizes in daily use, but there are other uses to which the various classes of timber are put. For example, the smaller sizes of beech and oak are sent direct from the woods to the chemical works to be made into vinegar and charcoal. Small ash is used for tool handles if clean grown. Bent timber of oak or elm is used in boat-building and boat repairs. The smaller sizes of clean oak are cut up for telegraph arms. Beech is used for butchers' tables, wheel-cogs, and plumbers' tools, while large well-grown willow and poplar are used for saddlers' and shoemakers' cutting-benches, as also for railway carriage-brake blocks. Plane or sycamore trees under 6" diameter, whether branches or stems, are used by turners for making fancy boxes of small sizes; those from 6" to 10" diameter are cut into spinning-mill pressing-rollers 7" to 9" long and 1 $\frac{3}{4}$ " thick; from 10" to 19" in diameter are used by cabinetmakers—to order—and for bakers' troughs and tables, rollers for washing, wringing, and mangling machines. All large cleanly grown cuts are sent direct to the calico-works for printing-blocks, but nothing less than 20" diameter is of use. The inferior cuts, both of the main stem and branches, are cut into barrel staves and ends.

The spruce fir is used for the same purposes as the Scots fir, and in the manufactured state the former gives nearly the same price as the latter, except when the latter is old and matured, when it gives a half more.

The fact is that in a properly managed establishment there is very little waste, and if a distilling apparatus and wood-pulper be added there need be none, not even of the sawdust. It is found that the charring of the latter in a common gas-retort renders it a most excellent disinfectant for stables, byres, piggeries, and poultry-houses, and after becoming saturated with the manurial ingredients, it forms, as might be expected, a very good manure. Sawdust made into "briquettes" by the refuse of coal-tar would form quite a profitable trade. The fuel would be equal to the best coal, and would cost less, the machinery for production being simple.

Sawdust is now made into building material, and is used by the Americans instead of bricks or stone. It is both water-tight and uninflamable, and can be sawn and planed like common deal. The cohesion is obtained by the sawdust being mixed with magnesia cement and chloride of calcium, and its

hardness by being subjected to extraordinary pressure. It is well known that glucose is easily made from sawdust, and from glucose to spirit or alcohol is only one step.

So many things can now be made from wood refuse, and wood of small size and poor quality, that it is remarkable that there is no industry or manufacturer in this country dealing with it. A few examples might not be out of place. It is well known that most of the paper in general use, such as that used for newspapers, periodicals, and books, and ordinary writing paper, as well as all kinds of packing paper, is made from wood-pulp.

Silk is now freely made from wood-pulp, and its manufacture is a staple industry in the St Etienne district of France. Wood-pulp is also largely used in the construction of the tubes of heavy ordnance. In Bohemia the wood of the common pine is made to do duty for both cotton and silk, and is used as the foundation for many of the textile fabrics. The process is somewhat as follows. The wood of the Scots fir is reduced to thin shavings, and is subjected to the action of steam for from ten to fifteen hours. It is then treated, in the same way as the wood for making pulp, with strong sodium lye and heated under great pressure for about forty hours. It is then mixed with castor-oil, caffeine, and gelatine, when it is ready for reeling off for spinning.

Whether or not the producer should be the manufacturer of his own wood is a question which must be answered by the individual producer as circumstances may indicate, but it cannot be denied that much must depend upon the knowledge of the forester or manager in charge whether the undertaking will be a paying or a losing concern. If the forester has not got a full knowledge of the manufacture, sale, and markets for his timber, it is out of the question to suppose that it would succeed. It is only just to state that a mere routine knowledge of these is not sufficient. Timber manufacture on a large scale under such circumstances would end in failure and disappointment.

FAMOUS AYRSHIRE SIRES.

By ARCHD. MACNEILAGE, Editor, 'The Scottish Farmer.'

THE difficulty which at once confronts the historian of any department of the Ayrshire breed is the well-known division of the breed into milk stock and yeld stock. This division has become so marked as to necessitate the appointment in most cases of two classes of judges, and the extreme men in both sections will hardly admit that an avowed patron of the section to which they do not happen to belong can possibly know anything of the section on which they bestow their attention.

When this cleavage took place in the Ayrshire ranks it would perhaps be difficult now to determine; its effect, so far as our present enterprise is concerned, is to divide the sires to be mentioned practically into the two classes of the known and the unknown. Many of the best bulls in what is called the milk section are nameless: they are the sires of the prize-winning cows in milk; the cows with tight level vessels, and teats evenly planted, and hanging perpendicularly, but, as a rule, of little note as queys or after their show career is over. The history of bulls in the yeld section is more like the history of sires in other breeds: the stylish show bull with gay carriage, sweet stately head, great branching horns, and thin shoulders, is very likely to breed stock like himself, winners in the younger classes, where form and gaiety count for much, and formation of vessel and teats is, for obvious reasons, of little moment. As far as possible we shall try to preserve the balance fairly, and tell the best we have learned about the principal sires of both sections.

But first of all there are the historical bulls to be dealt with, those which even the older men in the ranks of Ayrshire breeders have barely seen, and can speak of at best from tradition. Whatever else may be said of the breed, it cannot be claimed that its males of to-day are more masculine-like than the older sires, and the portraits here given from paintings in the possession of the Highland and Agricultural Society are invaluable as illustrating the change in type. Whether that be a change for better or for worse may legitimately form matter of debate.

The Ayrshire Agricultural Association.

This association has during its long career played a most important part in moulding the type of the Scottish dairy breed. There is before us a copy of its premium list for the year 1837,

bearing the autograph of Mr James Murray, Carston, and dated Ayr, 18th January 1837. The association is there styled the General Agricultural Association for Ayrshire, and the premiums offered include the prizes for live stock to be held "at the Great Show to take place at Maybole on the 1st day of June 1837." The cattle classes are for the two breeds of Ayrshires and Galloways, both of which are described as "Dairy Stock." In the class for bulls not under three years old the first prize is eight sovereigns, the second five sovereigns, and the third three sovereigns. For the best two-year-old bull the first prize is six

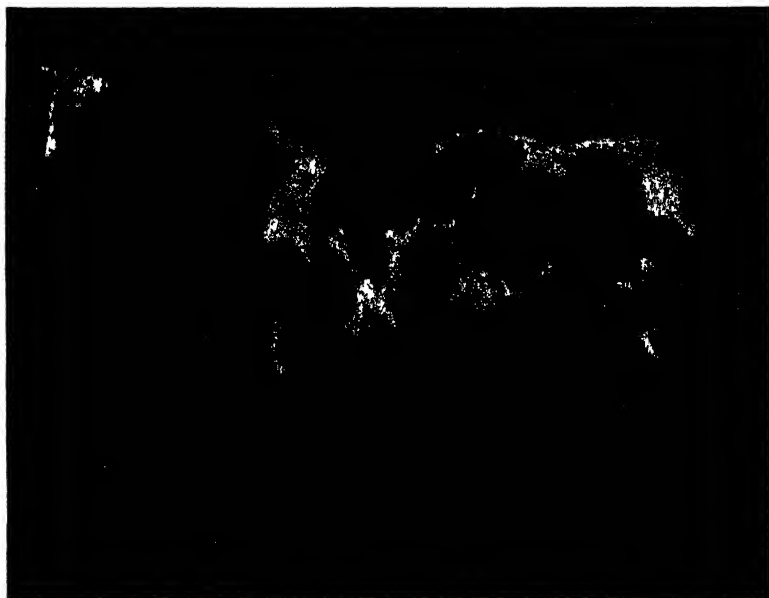


Fig 60 —AYRSHIRE BULL, "GEORDIE"¹
Bred by Mr James Walker, Stewarton, Ayrshire

sovereigns, the second three, and the third two. There are three classes for cows—aged, three-year-olds, and two-year-olds—from which we infer that there is not likely then to have been much encouragement given for bringing forward yearlings of both sexes in the fashion so familiar at the present time.

In these circumstances, the famous bull whose portrait is here given (fig. 60, Geordie) would not be exhibited, although he was then one year old. He was bred by James Walker in

¹ Figs. 60 and 64 are reproduced from paintings in the possession of the Highland and Agricultural Society, and figs. 61, 62, and 63 from portraits in the Ayrshire Herd Book.

Stewarton parish, and was owned by Robert Logan, Stoneyholm, Kilbirnie. He was not in some respects unlike the more modern bull Hover-a-Blink. He was flecked, or red and white; gay and masculine-like in appearance, but might have been deficient in depth of rib. He was a favourite breeding bull, in great request in North Ayrshire and the neighbouring parishes in Renfrewshire, and gained first prize at the Highland Show at Inverness in 1839. It required no ordinary pluck to send a bull so far in those days. He eventually went to Bute, to Mr Hunter, Ettrick. In 1840 another Geordie was second at the Ayrshire show held at Girvan, when owned by Mr Ivie Campbell, Dalgig, New Cumnock, one of the greatest of the Ayrshire enthusiasts of his time. This bull came from Mr Dickie, Bogside, and was a grandson of the famous Swinlees bull to which reference will subsequently be made.

A son of Geordie which left a strong impression on the breed was known as the "Horny bull." He was used by all the leading breeders in the district already named, and amongst others by Mr John Reid, Auchengown, Lochwinnoch, who patronised the best bulls the district could afford. The "Horny bull" was of the same colour as the well-known Shorthorn champion "Sign of Riches," red, with a white mark on his back, and was a very big and heavy bull. Mr Reid had a steer by him which, at six quarters old, weighed 28 Ayrshire stones = 6 cwt. of beef. As his name indicates, he had a faulty horn, the fashion being in favour of the gay upstanding horn, while his was inclined downward. He was a prize-winner locally, and bred good stock in every way, the vessels being correct, and the frame and gaiety sufficient to carry the stock through in good company of any kind.

A son of this red bull was promised to a Mr Dunlop in Kintyre, and was placed in charge of a butcher to be taken over there in the autumn. Instead of shipping him as arranged, the butcher sold the calf to Mr Bartholomew, Millbank, Lochwinnoch, who showed him successfully. He was purchased by the Duke of Buccleuch, and after being for some time in his herd he was bought by an Ayrshire farmer, and became stock bull in the celebrated herd of Mr Parker, Broomlands, Irvine. This bull was in colour red, with a white spot. He lived to a very old age, and bred big roomy cows with good vessels and teats, and good milkers. It was in connection with his stock that breeders began to pay great attention to the vessel and teats, and, in the end, the fancy for having the vessel tight and level and the teats perpendicular and broad in the point fostered the desire for small teats, which, as a rule, were better planted. This fancy became a snare to breeders, as all the world knows.

"Holmbyre Sandy."

A contemporary bull would be "Holmbyre Sandy," calved somewhere in the "Thirties, and known to have lived until he was twelve years old. He was a red bull bred by Mr T. Paton, Swinlees, Dalry, who is usually credited with having introduced a cross of West Highland blood into the Ayrshire, giving the breed the fine heads and sprightly horns which are not its least pleasing characteristic. It also gave the Broomlands stock the clipped ear, known to the older show-goers as the "Parker lug." This came into the Broomlands stock from the Auchengown red bull which went to Mr Parker by way of Drumlanrig. The brothers Murdoch—James of Carntyne, and Alexander of Hilton, Bishopbriggs—went to North Ayrshire when Holmbyre Sandy's stock was in its prime. They bought a dark-brown bull after him, which bred well in both stocks, but especially in Carntyne, and females tracing descent from this bull went to Mid Ascog and Woolfords, founding these famous herds. Burnhouses also drew on Carntyne at a comparatively early date. The leading Ayrshires at the first show of the Glasgow Agricultural Society were got by this bull. One of the queys had a dark-coloured head, a distinct feature in the early Ayrshires, while the other was wholly brown. The first prize-winner was sold to Mr Armour, Kirkintilloch.

"Tam of Dalgig" (520).

"Tam of Dalgig" was the short, and by no means very distinctive, name of a bull of great repute about the year 1840. He was bought in 1839 by Mr Ivie Campbell from Mr Allan, Blackstone, Dalry, and was a dark-coloured bull with white markings, and the dark-coloured or almost black head which characterised the descendants of the Swinlees bull got by the Ayrshire of the period out of the West Highland black cow. Blackstone old bull, which won third at Ayr in 1835, was the sire of Tam, and he in his turn was first at Dalry, Ardrossan, and the county show as a yearling, and lived to a good old age, but in his later years was troubled with a bad temper. He was of great size, had very long horns, and left many prize bulls and cows. Another son of the Blackstone old bull bore the more honourable name of

"Jock's the Laird."

Jock was bred at Holmbyre and went to Montfod, Ardrossan. He was of the same age as Logan's Geordie, dark in colour, with black about his head and neck like his sire. He was first at

the county show at Kilmarnock in 1842, at Maybole in 1843, and at Cumnock in 1844. He was owned for a time by Mr Anderson, Gillespie, Glenluce, well known in Clydesdale annals, but, according to our information, was not specially noteworthy as a breeding animal.

"Kilmaurs."

This was a brown, thick-made bull, calved in 1838 or 1839, and bred by Mr Young, Kilmaurs Mains. He gained two prizes, and was a good breeder in the hands of Mr Hyslop, Bank, Cumnock. A more famous bull owned by the same gentleman was a son of "Tam of Dalgig," bred by Mr Ivie Campbell, and calved in 1843. He was brown in colour with white spots; had long horns and a good back; and won first at the county show, while his stock were well known there.

Several sires unknown to the showyard flourished about this time, and their stock figured to good purpose in the prize lists. The Raws bull, calved about the same time, and owned by Mr Pollock, Raws, Kilmarnock, was sire of two queys in milk which gained first and second prizes at Ayr in 1847, and are said to have been the best seen in the showyard up to that time.

The Outmains bull, although of later date (he would be calved in 1848-49), may as well be named here also. He was owned by Mr Wilson, Outmains, Tarbolton, and was a noted sire, his stock taking a big share of the tickets at Ayr and Tarbolton.

Dumfries Highland Show, 1845.

At the Highland Show at Dumfries in 1845 three bulls of more than local reputation tried conclusions. The first was owned by Mr George Lorimer, Kirkland, Sanquhar, and was bred by Mr Lawrence Drew (the elder), Carmyle, Tollcross. The dam of this bull was a cow named "Medal," which Mr Drew gave in a present to Mr Lorimer. He won thirteen first prizes, and was first at Cumnock and third at Ayr. He was a thick square bull with good horns, but wanted about the thighs. The second was known far and near as Algie's bull. He was black in colour, and was owned by Mr Lawrence Drew. In 1846 he was second at the Ayrshire show at Girvan, being beaten by M'Gregor's bull, which was brown in colour with white spots. Algie's bull came from Gleudrishag, Ballantrae; his chief defect was in formation of head, and he was only moderately successful as a sire. The third good bull at this show was owned by Mr Hugh Kirkwood, Langmuir, Kilmaurs. He was bred by Mr Young, Mains, Kilmaurs, who had a superior dairy stock, to which all the show-fanciers, including Mr Parker, Broomlands, were indebted.

The Ayrshire Show of 1847.

This show was held at the county town, and the leading bulls were owned respectively by Mr Guthrie, Crossburn; Mr Morton, Townhead of Drumley; and Mr Ivie Campbell. The first and second were red bulls, the second (Mr Morton's) being whole-coloured and in every way successful. His sire was the famous "Geordie" (Logan's), whose influence continued to be felt for many years. Mr Morton was a go-ahead man for his time. He held a sale of yearling bulls got by his prize bull, and issued a sale catalogue with pedigrees. The prices realised went up to £15 and £20, which would not be regarded as bad even now. Mr Campbell's third-prize bull on this occasion was. Mr Lorimer's Dumfries winning bull "Carmyle" out of "Medal," which Dalgig had purchased in the interval.

James Andrew's Bull.

The next bull of note is James Andrew's bull from Greenwood, Irvine, which gained first-prizes at the Ayrshire show three years in succession—viz., at Ardrossan in 1848, at Kilmarnock in 1849, and at Maybole in 1850, and in the last-named year he was also first at the Highland Show at Glasgow. He was bred by Mr Orr, Blackburns, Kilbirnie, and was a red-and-white bull of great size, with horns rather low and outspreading, but he had splendid back and ribs. He was sire of the winning bull at Ayr in 1853, which bore a striking resemblance to his sire, but none of the female progeny of Andrew's old bull were known to the show-ring, although they were great dairy cows.

The commended bull at Glasgow in 1850 was William Ritchie's from Broadwood, Coylton; he was bred by Ivie Campbell, and got by "Tam"; was third at the Ayrshire show, and, like the rest, was a big red bull, with plenty of masculine character. Mr Morton, Townhead of Drumley, also exhibited a good bull at this show. He was afterwards owned by Ivie Campbell, and his sire was the second-prize bull of 1847, which bred the dear yearling bulls.

The Ayrshire show was held in the county town in 1852, and has never since been held elsewhere. At that show, in a class of twenty-eight old bulls, the leader was a dark brown and white bull bred by Mr Morton and owned by Ivie Campbell. In the previous year he was second at the county show at Cumnock, the first on that occasion being a very fine red-and-white bull owned by Hugh Kirkwood, which went to Mr Milligan, Hayfield. The third was Ritchie's bull. He was bought by the Duke of Buccleuch, and the Dalgig bull bred by Morton

was bought by Mr Hyslop. All three tried conclusions at Sanquhar, when the Duke was first, Mr Milligan second, and Mr Hyslop third.

"Major."

About the year 1850 began the career of Mr Parker, Broomlands, Irvine, and in 1854 his great bull "Major" was first at Ayr. He was bred by Mr Parker, was brindled in colour, with long fine horns, rather lacking in strength perhaps for a male. His dam was a famous brindled cow at Broomlands, while either his sire or his grandsire was got from Mr Young, Kilmaurs Mains. He was first in 1853 at Glasgow, East Kilbride, and Ayr as a two-year-old, but when he went to Glasgow in the following year he was only placed third, the first being a celebrated show bull belonging to Mr Robert M'Kean, Lumloch, and the second belonging to a Mr Cameron. At this show "Major" was bought by Sir Michael R. Shaw Stewart, Bart., but becoming ill-natured, he was destroyed not long afterwards.

"Major" was possibly the first of the great Ayrshires which attracted universal attention to Mr Parker's herd. The owner devoted his whole attention to his Ayrshire yearlings. He was a typical farmer of the old school, and, no matter how employed, invariably wore a tall hat. Mr Parker deserves to be remembered as one of the great stock-breeders of Great Britain; he left the impress of his genius on the Ayrshire breed, and had those who followed him been content to adhere to his ideals, there would have been less complaint than was for long so common about the lack of commercial value and merit amongst Ayrshires.

"Cardigan."

"Major" was undoubtedly a famous sire. His first great son was "Cardigan," a bull bred by Mr Parker and owned during his public career by Mr Ivie Campbell. His epoch is clearly indicated by his name, borne in honour of the leader of the forlorn charge at Balaklava. "Cardigan" was first at Ayr as a yearling, a two-year-old, a three-year-old, and a four-year-old, and only once suffered defeat, being unplaced at Glasgow when a yearling. In colour he was very dark brown, or nearly black; like his sire, he had long horns, which were scarcely wide enough, but his neck, shoulders, back, and tores were faultless. His female produce were not famous in the showing, being rather deficient in the formation of the milk-vessel—in fact it was said that he only left one good cow, which can be interpreted from the showyard standpoint and easily understood. His produce were characterised by great bodies but

were deficient in style, and, although faulty in their vessels, were furnished with good teats, and had a good reputation as milkers. In fact our impression is that "Cardigan's" female progeny would now be in high favour in an auction-ring. He was a popular sire of bulls; yearlings by him were first and second at the Cumnock show, and, in modern language, he must have ranked high amongst the sires of yeld stock. The only photograph of this great bull was unfortunately burned, and our knowledge of the history of the Ayrshire breed is distinctly poorer by this mishap.

The bull which stood second to "Cardigan" at Ayr in 1856 was owned by Mr McGregor, Ditton, Riccarton, and stood first in the previous year. He was a brown bull of outstanding merit, except in respect of the formation of his head, which was distinctly faulty. He was purchased by Mr Daniel Craig, Polquheys, who successfully exhibited him at the first Paris Exhibition. The third was a dark-brown bull with some white; he was owned by Mr Hugh Kirkwood, Langmuir, and went to the Paris Exhibition also. Sir James Fergusson of Kilkerran, Bart., offered £100 for "Cardigan" for the same purpose, but Mr Campbell would not sell him. The judge at Paris was the late John Baird, Lochwood, Gartcosh, who also acted at Ayr, but his opinion was overridden at Paris by the French members of the jury, who put Mr Kirkwood's bull first.

"Cardigan" had a full brother named "Sir Colin," which won first as a yearling and a three-year-old both at Ayr and East Kilbride. He was purchased by Mr Tweedie, Castle Crawford, Abington. In 1857 "Cardigan" was followed at Ayr by a big white bull owned by Mr John Stewart, Strathaven, and the third was a Broomlands bull got by "Major." In 1858 the first prize three-year-old at Ayr was a yellow-and-white bull named "Rob the Ranter," and owned by Mr Robert Dunlop, Aulton, Kilmaurs. He too was by "Major," and his dam was first at Ayr in 1854. He was bought by Mr M'Culloch, Auchness, Stranraer, and was a good breeding bull.

"Clarendon."

The second prize-winner on this occasion was a greater bull in some respects than "Cardigan," though hardly so uniformly successful as he in the showyard. He was bred at Broomlands, owned by Mr Ivie Campbell, got by "Major," and his name was "Clarendon." He was again second at Ayr in 1859, being beaten by another Broomlands bull, afterwards owned by Mr Drew; but in 1860 he was first both at Glasgow and Ayr, the winner of the previous year being second. The dam of "Clarendon," a very fine brindled cow, was a steady breeder of

good calves, while the dam of "Cardigan" was not at all in favour with lovers of milk stock. The bull which beat "Clarendon" in 1859, and went to Mr Drew, was got by a son of "Major" out of the dam of "Cardigan."

"Clarendon" was a most successful sire of milk stock, and his influence can still be traced, notably in the Muir stock of Mr James Murray, a descendant of his having been first and champion at Cumnock more than once. His female produce made grand, big, substantial cows, with good heads and right good vessels and teats. In 1862 Mr Murray, Carston (who still survives in his ninety-eighth year, and has been an interested assistant in compiling these notes), was a winner at Ayr with queys by him, and Mr Campbell was first at Glasgow with another of his produce. A son of his was second aged bull at Ayr in 1861. He is still a prime favourite in the memory of the older fanciers. He fell a victim to one of the early visitations of pleuro-pneumonia.

Mr Parker was first at Ayr in 1855 with a two-year-old brindled quey, full sister to "Clarendon," which subsequently was twice first at Ayr and once at Glasgow as an uncalved cow. She was one of the best cows ever known in the annals of the breed. The Duke of Hamilton's prize-winning bull at Battersea in 1862 was by "Sir Colin," already named, and another great bull of the period owned by Mr T. Brown, Holm, was by "Cardigan." In 1864 Mr J. Hyslop, High Cairn, exhibited "Young Clarendon" at the Highland Show. He was bred at Dalgig, and was got by "Clarendon" out of "Skelpie" by "Cardigan." He was a red bull, which gained first at New Cumnock and third at Glasgow. For several years, between 1859-66, the show catalogues bear eloquent testimony to the influence of these sons of the Broomlands "Major." Their great substance, long branching horns, and dark colours, coupled with the brindled colours of their dams, are strongly suggestive of the influence of the West Highland cross introduced by Mr Paton. Swinlees. There is a tradition of the introduction of a Hereford cross by Mr Swan, Lochwinnoch; but whether this had any lasting effect may fairly be questioned, unless the excessive white in the colour of the modern Ayrshire can be traced to this source. The type, colour, and scale of the Ayrshires of the time of Parker scarcely leave room for doubt that the modern breed was greatly moulded (1) by the crossing of the native black cows of North Ayrshire by the Earl of Marchmont's Teeswater or dairy Shorthorn bulls, and (2) by the subsequent introduction of the West Highland strain, to which the style and gaiety of the breed as it now is can be traced.

"Yellow Bob" (172).

Leaving North Ayrshire or Cunningham for a little, a notable sire which flourished in Kyle claims attention. This is "Yellow Bob" (172), calved in 1861, bred by Mr Peter Connar, Drumdow, Coylton, and owned by Mr Ritchie, Broadwood, Stair. He was the founder of the great "Yellow Bess" tribe, and his produce won numerous prizes at the county and other shows. He was grandsire of "Cheer Up" (643), which won first twice at Ayr and once at Glasgow. This cow was bred by Mr Ritchie, Broadwood, and bought by Mr Connar for £100. She was dam of the bull "General Wolseley" (622), bred by Mr Connar, which went to Burnhead, and became sire of two of the most noted vessel cows on record, "Heather Honey 2nd" (5398) and "The Sloth" (vol. xi. p. 158).

"Burnhouses" (8).

Passing from the prehistoric into the period within the memory of men now in middle life, one bull stands out clear and distinguished amongst his fellows. This is "Burnhouses" (8), bred by the late Mr Lawrence Drew (the younger) at Merryton, mixed (but distinctly) brown and white in colour, and calved in 1865. He is described on all hands as a bull of great robustness of constitution, wide and roomy in his shapes, and although not a show bull, full of style and breed character. He was too masculine in shape to be popular with the fanciers of yeld stock, but his owner, the late James Howie, Burnhouses, Kilmarnock, who had great difficulty in getting Mr Drew to sell him, always regarded "Burnhouses" as the best sire of the right type of dairy cows he had known. His female progeny were full of style, with grand frames and rightly hung vessels, while their teats were rightly planted and of the proper dairy size. The rumous small-teated craze was at its height when the produce of "Burnhouses" first appeared, but he held the fort in spite of it, some of the fanciers saying the teats of his stock were not small enough for the present fashion—but all the same, they were the right sort.

Amongst the sons of "Burnhouses" which left an indelible impression on the breed were "Auchendennan" (1), "Burnhouses of Drumlanrig" (7), "Fleming of Drumlanrig" (28), "The General" (31), "Righead of Drumlanrig" (51), and "Burnhouses II." (106). When the first volume of the Herd-book was issued the first crop of females after "Burnhouses" were eleven years old; consequently very few of them were registered, and a good deal of data necessary to show his influence on the breed has been lost.

The first great success achieved by his produce took place at Ayr in 1870, when the five white queys from Burnhouses won the parish group prize, having previously, in single file, given a good account of themselves in the ordinary class. In the following year Mr Howie brought out five brown queys, three of which took first, third, and fifth in the Ayr Derby, and another daughter, "White-legged Beauty," on the same day was first aged cow in milk and champion female. She was bought on the same day by Mr J. M. Martin, and died at Auchendennan.

Many other prize-winners were got by this famous sire, notably "Lady Mary of Burnhouses" (441), champion at Kilmarnock in 1873; "Blossom" (48), Ayr Derby winner in 1875, and first as cow in milk at Glasgow in 1876; "Fanny II." (182), second three-year-old at Kilmarnock in 1871, and first cow in calf in 1872; "Fanny of Drumlanrig," second four-year-old in milk at Ayr in 1873; "Dewdrop of Drumlanrig," first four-year-old in milk at the Highland in 1874, and winner of the gold medal in 1875 and 1876; "Julia" (218), second three-year-old in calf at the Highland in 1877; "Lizzie," first four-year-old cow in milk, same day; and "Frost," cup-winner at Stirling and Dumbarton in 1876, first three-year-old in calf at the Highland Show in the same year, and gold medal winner at the great Edinburgh Highland Show in 1877. This cow was owned by Mr J. M. Martin, who sold her to the Duke of Buccleuch at the Highland Show, at which she won, for £80. "Burnhouses" ended his career in possession of Mr John M. Martin, Auchendennan, who had about as much trouble in getting Mr Howie to part with him, an old bull, as the latter had in getting Mr Drew to sell him as a young one. He was calved in 1865, his dam being a Merryton cow named "Scott." Mr Howie purchased him early, and sold him to Mr Martin in July 1872. He died in March 1877. There were five crops of calves from him at Auchendennan.

"Burnhouses II." (106).

This was a notable bull. He went to Mr Brown, Cartleburn, Kilwinning, who in 1876 and 1877 won first and second in the Ayr Derby with queys got by him. These were bonny stylish cows; the first, "Rosie," was red-brown in colour, and was bought by the Duke of Buccleuch, in whose hands she won first at Glasgow three years in succession. Mr Brown had two extra good queys by him in each year, full of style, with good teats, and altogether excellent dairy cows. The Derby winner in 1877 was bought by the Duke of Buccleuch for £120. Mr Allan, Munnoch, had a fine bull named "Winton" (64) by this bull, which also went to Drumlanrig and died there. Several

out of Cartleburn herd went to Bute, and did excellent service in the Meikle Kilchattan herd of the late Mr James Duncan.

"White Prince" (63).

This bull, calved in 1871, bred by Mr Howie at Burnhouses, and known as the "Company bull," shares with his grandsire "Burnhouses" the unqualified praise of all our correspondents. He acquired distinction as a sire under the name above indicated, and then passed into the hands of the Duke of Buccleuch at Drumlanrig. His colour, doubtless, had an effect in increasing the number of white animals in the Ayrshire breed. He was of the same class as "Burnhouses," but hardly so masculine in character. The females off the older bull were found fault with by some as being rather strong in the bone, which characteristic also belonged to "White Prince" and his produce. He was got by a Dykeneuk bull, and his dam was "Princess of Burnhouses," a very handsome heavy cow and one of the winning group in 1870. She was a great cow, and won the Blythswood prize for heavy cows at Paisley. If his list of winning stock is not so formidable as that of "Burnhouses," it is very much greater than that of most other sires. Amongst them may be named "Killoch" (230), which was first as three-year-old in milk, and took the Highland and Agricultural Society's medal at Kilmarnock in 1876; first as a four-year-old in calf, and the special prize at Kilmarnock in 1877, in which year she was also first at Ayr, and champion at East Kilbride. Another cow, "Gebbie of Drumlanrig I.," was first as a three-year-old in calf at Ayr, and first as three-year-old in milk at Glasgow in 1876, and second as a four-year-old in calf at Ayr and Glasgow in 1877. These two shows were then held in consecutive weeks: Ayr, as now, on the last Wednesday of April, and Glasgow on the first Wednesday of May. "Genty 2nd" was first as a three-year-old at Galston in 1877; "Dainty" was first as three-year-old in calf at Kilmarnock in 1876, and first in the Glasgow Derby, as well as second as quey in milk in the same year; while "Whin-flower" was first as four-year-old cow in calf at Kilmarnock in 1876. These were all daughters of "White Prince."

"Heather Jock" (33).

This was a white bull calved in 1875, bred by Robert Duncan, Brockwellmuir, Dunlop, and sold to Alexander Steel, Burnhead, Darvel, when two days old, for £25. He was one of the most successful sires of cows with fancy vessels the Ayrshire breed has known, being sire of Major Steel's great winning cows "Heather Honey" (2158) and "Hover-a-Blink" (1212). His

history can hardly be told without some reference to his dam, the famous cow "Brockwellmuir" (64), one of the epoch-making animals in the story of the modern Ayrshire. She was a very substantial, large-framed cow, with perfect vessel and teats, and great body, with style to show herself. Her legs were strong, and some say she was a little too masculine in her form. Still, she belied appearances, and wore very well—never getting coarse—and breeding a class of animals now become rather scarce. She was sold at the Auchendennan sale in April 1877, to her breeder, in whose hands we think she ended her days.

"Heather Jock's" produce had something of the strength and substance of body which characterised the old cow, and their vessels were generally correct, but some of them had rather much of the modern fault of small teats. "Heather Jock" was sold by Major Steel to Mr John Steel, Fardenreoch, New Cumnock; but although it was during this period that he bred the Craighman Derby qucy, he did not breed so well there as at Burnhead.

"Loudoun" (275).

This was a white bull, calved in 1875, bred by Mr Alston, Loudounhill, Darvel, and owned by Mr James Howie, Burnhouses. He proved a successful sire, was got by "Heather Jock" out of a cow which was fourth in milk at Ayr, and perhaps his most famous get was "Lady Bell," champion female at Ayr two years in succession, 1885 and 1886, and also winner of the special prize at Kilmarnock in the former year. This bull bred several prize-winners at Ayr and Fenwick. One was "Killoch III.," second in Ayr Derby and qucy in milk class, and second in Glasgow Derby when three years old.

"The Earl" (20).

This was a bull bred at Burnhouses in 1875, and sold to Mr John Murray, Borrowmoss, Wigtown, one of the Ayrshire men who shifted his quarters into Galloway. When in Grougar parish in Ayrshire Mr Murray was a near neighbour of Burnhouses, and the present tenant of Borrowmoss, Mr William Murray, received his early training in Ayrshire points and lore from the late Mr Howie. "The Earl" was a son of the famous "Burnhouses" (8), and was white in colour, with brown cheeks. Mated with the large-framed roomy cows which the Murrays, especially the grandfather of the present tenant of Borrowmoss, always aimed at keeping, "The Earl" proved a successful sire, and laid the foundation of the present-day herd in Borrowmoss, certainly one of the best all-round collections of dairy cattle in Scotland. "The Earl" was a "sweet" bull, and stamped his

progeny in the same way. His cows had good vessels that helped the milkers, and in the main they proved profitable cattle. "The Earl" himself was fattened off when six years old, and drew £32 in Liverpool market—a good price, surely, for a fat Ayrshire bull, and quite a conclusive proof of the quality of the stock got by "Burnhouses."

"White Prince of Stonecalsey 2nd" (285).

This was another good-breeding bull which was used at Borrowmoss—rather a curiously-named animal, seeing that his own colour was dark brown with white legs. He was calved in 1880, and several of his daughters still survive, good old cows, testifying to the merits of their sire. He won many first prizes at the Wigtown shows, and was altogether a good sire of dairy stock.

Major Steel's herd at Burnhead furnished a greater number of showyard winners than any other during the period from 1885 to 1894. The cows here were specially distinguished by their good frames and tight level vessels, but some of the families in the herd were vitiated by having the small "corky" teats, which latterly have become rather unpopular

Tight Vessels and Small Teats.

Before giving particulars of some of the more successful sires used at Burnhead in addition to those already indicated, it may be proper, and serve a good purpose, to insert here what is usually regarded as the authentic history of the craze for tight vessels and small teats. Nobody wanted small teats for their own sakes, but it was found that the tight level vessel which everybody wanted was usually furnished with the small "corky" teats, perpendicularly hung; and it is further alleged that these teats were popular with the "fancy," because they were more easily "set" by the aid of collodion than the more serviceable long teat. Further, it was popular to have teats broad in the ends, and, if possible, not tapering, and this formation is more frequently conjoined with the short teat than with the long one. Doubtless all these considerations have to be looked at when the philosophy of the small-teat craze is being debated; but the great cause of the fashion was the success of one cow known in the history of the breed as

Drew's Wee Black Cow.

According to one story, this cow was bred at Browncastle in Avondale, and according to another, it is understood to be

unknown where she was bred. She was picked up by a cheese merchant named Mr Struthers, on his ordinary journey, in a stock in Avondale, probably as part of a "deal" in cheese, and was sold by him to the late Mr Lawrence Drew, Merryton, who showed her with great success for two or three years, and then sold her to Mr James Nicol Fleming, who was at that time farming at Drumburle in Carrick. Mr Fleming named her "Mrs Baird," and exhibited her with unvarying success for several years. She was undersized in every way, but her vessel was very tight and level, and this carried her to victory for many years. Her teats were small, and it is said needed setting.

Bull calves off this cow were used everywhere, and, in the opinion of many, did much to impair the usefulness of the Ayrshire as a dairy cow. One of these was named "Cambusdoon," and it is said that his produce practically ruined the herds in which they were used. A daughter of "Mrs Baird's" won the Ayr Derby in 1874, being followed by a quey owned by Mr Parker, Broomlands—a fact which has a somewhat pathetic interest, as this was almost, if not the very last occasion on which the veteran exhibited. His fine class of dairy cattle were not appreciated in the days when "Mrs Baird" and her followers were held in honour. In 1872 Mr Fleming was first and second in Ayr Derby with "Robina" and "Queen 2nd," a pair of fine heifers; but one, if not both, was in calf to "Cambusdoon," and the calf, a bull, being purchased by a noted breeder of that time, his stock was far from being improved by him.

"Airblaes."

"Airblaes" is a bull with a very bad reputation in the minds of those who dislike the small teats. He was bought by Mr Fleming from Mr Drew along with the dam of the Clydesdale "Prince of Wales" (673), and his produce being in high favour, did much to popularise the small teat.

Auchendennan Stock.

In the early 'Seventies—and also to some extent in the 'Sixties—few herds attained greater distinction than that of Auchendennan, then owned by Mr John M. Martin. Whatever Mr Martin took in hand in the way of stock-rearing he made a success, and his Ayrshires, although to some extent of the fashionable vessel and short-teated kind, were, thanks to "Burn houses," not wholly so; they were what the "fancy" demanded at the time, and the sales of the Auchendennan bull-calves always attracted plenty of buyers and good prices. "Drum-

burle" (not the bull of that name already referred to) was the first bull used; but this period in the history of Ayrshire cattle is likely to be commemorated for all time by the career and fame of the bull named

" Auchendennan."

He was bred at Auchendennan on 22nd March 1874, and was got by the great "Burnhouses" out of his own daughter—a cross suggested to Mr Martin by Mr Pollock, Rawe, a noted judge of the time. His dam was one of the five white queys, and was first as a cow at the Highland Show at Kelso in 1872. His colour was peculiar, yellow-brown and flecked. He was a substantial animal, with plenty of character, and left well-framed cows of the same type, with rather soft vessels—what the fancy called "clashy"—and teats of fair length, but the tribe as a whole was not noted for its milking properties. Still, it has not been without its influence on the breed, and that of a beneficial character, the roomy frames and open chests being decidedly important points in dairy cattle, while their family likeness was known everywhere. The Auchendennan herd was dispersed in April 1877, when the bull-calves, most of which were got by "Burnhouses," made a very high average.

"Auchendennan" was exchanged by Mr Martin, when a calf, for a Knockdon yearling bull, and was sold at the Knockdon sale in October 1876 to the Hon. G. R. Vernon for £44. He next passed into the hands of Mr Middlemass, Auchenames, Renfrewshire. Mr James Lockhart, Mains of Airies, owned him for four years, and he afterwards went to Mr Caldwell's, Bogside, Dundonald, in whose possession he died.

While there is difference of opinion regarding the dairying value of the kind of cows bred from this bull, there can be none at all as to the demonstration which his case affords of the success of inbreeding in producing an impressive sire. As we have said, he was got by "Burnhouses" out of his own daughter. Space does not admit of proof at length in support of his impressiveness; that is supplied by the records of the breed.

" Bright Smile."

Amongst the more modern families of Ayrshire cattle hardly any one achieved greater distinction, or is more worthy of mention, as combining the excellences of commercial dairy cattle with the level tight vessel and good teats, than that which bears the attractive name of "Bright Smile." The first cow of this line which, in the hands of its founder, Mr John

Murray, jun., Carston; Mr Robert Wilson, Manswraes; and Mr John Holm, Jaapston, won so many prizes, was got by a bull named

"Johnny Faa" (399).

He was bred at Carston from a cow named "White Meg," and his sire was "Brickwoodhill." He was a substantially built bull, a little short in the rib; but his stock had capital vessels and teats, and, along with these, good substantial frames like his own. The "Bright Smile" family for several generations in the female line furnished noted prize-winners, and perhaps more than most prize cows their influence remains as a distinct contribution to the maintenance of sound commercial points in dairy cattle. The first "Bright Smile" (1307) won the Ayr Derby in April 1881; in the following week she was first at Glasgow, and, in brief, she was first at Ayr and Glasgow three years in succession. One of her calves was the great "vessel bull,"

"Prince Charlie" (1931).

He was bred by Mr John Holm, Jaapston, Neilston, and was bought when a calf for £30 by Mr George Alston, Loudounhill, where he bred well and made the strongest hit. Mr James Lawrie, West Newton, Avondale, purchased him from Mr Alston, and, after a little, sold him to Mr Cross, who used him for several seasons. Perhaps the best of his produce was the fine cow "Judy" (8059), which won the Ayr Derby in 1895, and is acknowledged to have been one of the best cows the breed has seen for many years.

"Torcross" (210).

This bull was well known in the same neighbourhood as "Johnny Faa," and exerted a powerful influence as a breeding sire on the famous Orchardton herd, which was dispersed towards the close of 1899. The bull himself was bred by Mr Ivie Campbell, Craigman, New Cumnock, and was got by Braidwood bull, while his dam was "Myres" (319), bred by Mr H. Campbell, Torcross, and in 1874 fourth in Ayr Derby. She was known colloquially in the breed as "Torcross," and was one of the best Ayrshires of her time. The peculiar characteristics of the Orchardton cattle are well known. They were large-framed and very stylish, and although not so much characterised as some other herds by the fancy formation of vessel and teats, they had the much better qualifications of sound constitutions and good dairying properties. Several of the leading herds

have from time to time been recruited from Orchardton, and the Torcross influence is decidedly beneficial and noteworthy. The winner of the Derby in 1880 was a Craigman quey got by "Torcross." His dam was bought by the Duke of Buccleuch, and died at Drumlanrig.

In the year 1878 Captain Steel scored a great victory at Ayr, winning first in the Derby with the famous "Gem of Drumlanrig," and in the following year he was again first with her full sister "Juniper." For the former the Duke paid £100. Both were got by what is colloquially known as "Peter Connar's bull," or

"Drumdown II."

This was a red bull, and a remarkably impressive sire. It was he, indeed, that laid the foundation of the prize-winning fame of the Burnhead stock, a fame which continued unbroken until his dispersion on 19th March 1896, when the average price reached for fifty-four animals was £28, 12s. 3d., and the attendance at the sale was the greatest seen at any auction-ring in Scotland, except it might have been the Merryton dispersion sale after the lamented death of Mr Lawrence Drew in 1884.

The Burnhead cow "White Lady" (608), dam of "Gem of Drumlanrig" and "Juniper," already referred to, was dam of the bull "Hold Hard" (269), which bred well, being sire of the grandly bodied champion cow "Wee Maggie" (7248), which made 90 guineas at the Burnhead dispersion, and "Sloth 2nd" (7251), another Ayr champion, which was sold for £85. One of the best-abused bulls in the breed was the animal known as

"Fifty" (1370).

This title he owes to the fact that he was purchased for 50 guineas as a calf at the Drumlanrig dispersion. He came into Ayrshire, and it is said by some that it would have been well for the breed had he never been permitted to serve a cow. So far as the size of teat and dairying properties generally are concerned, this appears to have been the case; but he was used to a considerable extent at Burnhead, and had probably no equal amongst Ayrshire sires of his time in imparting style to his stock. Many sires in what is called the yeld section of the breed have done this, but the distinction of "Fifty" is that he bred cows with the kind of vessels wanted in the showyard, and at the same time imparted to them a style and robustness of constitution which nothing could surpass. Unfortunately he also gave them, as a rule, teats which were practically useless in everyday dairying.

Castlehill Stock.

Burnhead, Drumlanrig, and Auchendennan were three great sales in the history of Ayrshires; there is a fourth, Castlehill, which deserves to be classed along with them. This sale took place on 10th May 1894, and was remarkable for the high standard of the dairy stock put upon the market by Mr Abram Kerr, its popular owner. Eighty-six head made an average of £19, 4s. 9d. The stock owed its reputation largely to the splendid breeding bull

"Peter of Whitehill" (1397).

This bull was bred by Mr Thomas Kerr, and calved in 1886. He was bought at the Whitehill dispersion sale in May of that year by Mr Abram Kerr for £50, and was kept by him until he was thirteen years old. He was a fine robust bull, and never had an ailment during his long career. He was used in various herds, and proved sire of many prize-winners, including "Senorita of Graitney," the Ayr Derby winner of 1900. He was light red and white in colour, and as a sire of good sound commercial animals with grand bodies, good vessels, and the right kind of serviceable commercial teats, few sires of the breed at any time are better deserving to be remembered. Many of them may have a larger number of prize-winning animals to their credit, but few of such have left so permanent and beneficial an influence on the dairy stock of the south-west of Scotland. The success of the Castlehill herd with "Peter" as sire was largely due to the happy results of the combination of his blood with that of cows got by

"Loudoun Laddie" (1069).

This bull was bred by Captain Steel at Burnhead, and calved in 1883. Mr Kerr paid £20 for him as a calf one month old, and the speculation was amply justified, as he bred splendid stock. Both of Mr Kerr's leading bulls had the distinct merit of being well-coloured, and while it is quite true that a good animal can never be a bad colour, it does not admit of question that outside of prize stock many Ayrshires would command higher prices for the foreign market if they were less generally of a white colour. This has been the prevailing colour amongst Ayrshires for many years past, and an effort should be made to get back to colours more likely to be universally popular and more in keeping with the original colours of the breed.

A bull of distinguished reputation is

"Hover-a-Blink" (892).

This bull (fig. 61) was bred by Mr Thomas Hutchison, M'Croshton, Stair, and calved in 1881. He was "mirled" all over his body, and proved to be the sire of many good animals similarly marked. He was owned in succession by Mr Robert Osborne, Drumjoan, Ochiltree; Mr William Bartlemore, Lochwinnoch; and Sir Mark J. M'Taggart Stewart, Bart., M.P.; and



Fig. 61 — AYRSHIRE BULL, "HOVER-A-BLINK" (892)

Bred by Mr Thomas Hutchison, M'Croshton, Stair

one of the best judges of the breed at present informs us that he regards him as the best bull of his time. He was of great substance, with fine horn, but not strong, and he was a most impressive sire. In all his produce there was a great family likeness. The females were fine milkers, with fairly good vessels, and the most useful kind of teats. "Hover-a-Blink" himself won the Ayrshire Herd-Book champion prize, and was first at Ayr in 1884, '85, and '86, while four of his sons secured the same high honour — viz, the celebrated "Cock-a-Bendie" (1204), "Victor of Munnoch" (1477), "Traveller" (1441), and "Young Hover-a-Blink" (2107). Not only so, but all of these bulls,

both sire and sons, at one time or other won first at the Highland Show.

"Victor of Munnoch" was bred by the late Mr A Allan, and won the Highland Show at Glasgow in 1888. He was then sold for a very long price to go to Australia, and his reputation there is of the best.

"Cock-a-Bendie" (1204).

"Cock-a-Bendie" (fig. 62) having lived longest, and spent all his days in this country, is best known. As a sire of prize yield

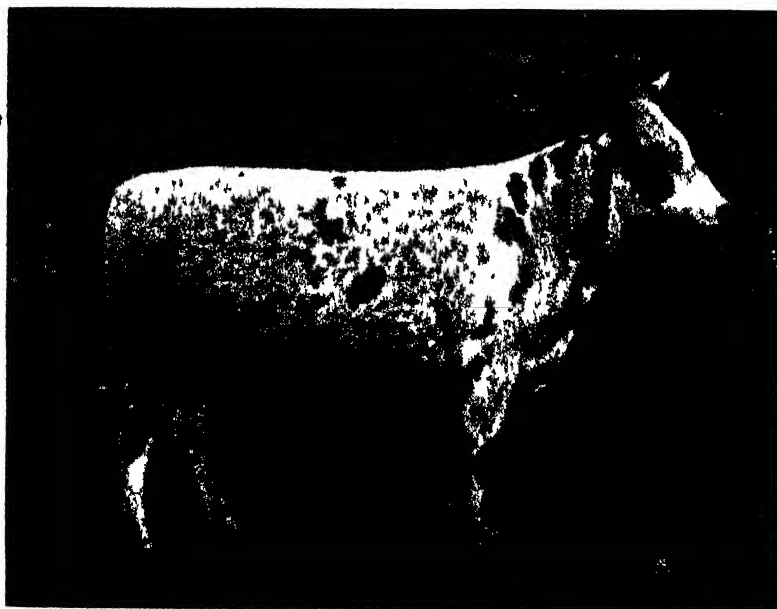


Fig 62 --AYRSHIRE BULL, "COCK A BENDIE" (1204)

At two years of age Bred by Mr Robert Osborne, Drumjoan Ochiltree

stock he is probably unrivalled. He was bred by Mr Robert Osborne in 1885, and, so far as we know, is still alive. He is almost wholly white in colour, and having won the Herd-Book championship four years in succession, is largely responsible for the character of the modern yield stock Ayrshire. His stock have inherited his own style, and to a large extent his own colour, and while his contribution to the breed in the matter of style, especially in respect of head and horn, has been very great, opinion is not strongly favourable to him amongst those who fancy milk stock. No doubt many of the males of this kind are deficient in masculine character, and

their deer-like heads and horns, of which the thin shoulders and narrow chests appear to be a necessary accompaniment, are possibly purchased at too great a cost to the constitution and hardiness of the race. As it would be impossible to name a tithe of the prizes won by stock got by "Cock-a-Bendie," we name none.

"Traveller" of Barcheskie.

"Cock-a-Bendie's" half-brother, "Traveller" of Drumjoan, afterwards of Barcheskie (1441), was calved in March 1886, and has been a great force in improving the style and gaiety of the Ayrshires in the Stewartry. In almost all the herds there these are to be found, but especially at Barcheskie and Hartburn, where both Mr Andrew Mitchell and Mr Andrew Slater respectively have fine collections of Ayrshires. More distinguished than the sire is his son

"Traveller's Heir" (2903).

He is a white bull, bred by Mr Andrew Mitchell, and was owned by Mr Robert Woodburn, Hillhouse, Galston. He has been successful in breeding many show winners, and it is a feather in his cap that they are of both kinds: as young stock they won in the yeld stock classes, and, as queys in milk, they have taken second and fifth in the Galston Derby. In 1899 two four-year-old cows by him were first and second in the cow-in-milk class at Galston, and a three-year-old was second in the quey-in-milk class at Prestwick in the same year. As any further details belong practically to contemporary history, we pass from this famous line of prize-breeding sires.

The first of these sires of fashionable so-called yeld stock was

Wattieston "Prince of Garlaff."

He was bred by Mr Patrick Coul, Wattieston, Beith, and owned by Messrs R. and P. Wardrop, Garlaff, Cumnock. The following racy note about him is from a well-known Ayrshire fancier in Stirlingshire: "The progenitor of the present race of flash Ayrshires was a bull bred by Mr Coul, Kilbirnie; I forget his name, but he gained first prize when a two-year-old at Ayr show, and was purchased by the Messrs Wardrop, Garlaff. He had a great head of horns, was thin in the shoulders, rather flat in the rib, but deep, with a good top and bottom line." The raciness of the foregoing comments will probably excuse their severity, even to those who favour the Ayrshire with "the great head of horns," and making deduction for the spice of exaggeration, it will be accepted by not a few as a

fairly good account of the kind of animal which too often sweeps the boards in the yeld stock classes and passes into oblivion. Many of these bulls sold well fat — “Wattieston Prince” growing into an immense animal.

Other notable sires of the same class, although not all subject to the same severe criticism, were “Johnny Raw of Hillhouse” (1514), bred at Garlaff, and owned by Mr Robert M’Kinlay, Hillhouse, Sandilands, one of the most successful of modern exhibitors; “Craigs of Kyle” (1793); “Lord Glencairn of Lessnessock” (1818), a substantial bull with some substance, and the sire of robust good stock; and

“*Adjutant*” 1819.

“Adjutant” was decidedly one of the most popular sires of his class in recent years. He was bred by Mr Robert Montgomerie at Lessnessock, Ochiltree, in 1887, was a big, straight white bull, which gained first prize at the Lanark show and sale, and passing into the hands of Mr Thomas Scott, Netherhall, Lanark, and then into those of Sir Mark J. M’Taggart Stewart, he has proved a most successful sire. Many of the best breeding cows with which he and “Douglas Chief” (3400) have been mated at Hillhouse and Netherhall were got by “Johnny Raw” (1514), bred at Garlaff in 1885, and got by “Hover-a-Blink.” This was a big thick bull, white and brown in colour, and although never shown, he has left a good impression on the breed through the medium indicated.

In recent years the most distinguished Ayrshire has been the famous “Lady Flora of Burnhouses,” and no notice of Ayrshire sires would be complete without reference to her sire, a comparatively unknown bull named

“*Bute of Burnhouses*” (3388).

He was calved in 1890; bred by Messrs R. & J. M’Alister, Mid Ascog, Rothesay; and owned by Mr James Howie, who for once rather missed the mark by not using “Bute” more generally. If there had been a large number of stock of the stamp of his famous daughter left by him, the breed would have been benefited in an unusual degree. She was a cow with a splendid head and great frame, with all the style and character which the most fastidious in these points could have desired, and her vessel and teats were just the thing wanted by all dairy farmers. She was the ideal animal, being popular alike with the yeld-stock men and those who fancy animals in milk. She was first as a three-year-old, and champion of the yard at Kilmarnock, in milk; winner of the Ayr Derby and champion female of the

breed at the Ayrshire show; first in the Galston Derby and champion female there in 1896. In 1897 she was first at all the spring shows, and champion female at Kilmarnock, Glasgow, Ayr, and Galston. This unbroken and unparalleled round of victories was repeated in 1898, and it is quite certain that no cow of equal merit has for three years in succession maintained the premier position in the Scottish shows.

Another get of "Bute" was "Killochine of Burnhouses," which gained first at Paisley, and first and championship at East Kilbride, in 1896; first as cow in milk at Barrhead, and second at Paisley, and first and special at East Kilbride in 1897. Yet another daughter of "Bute," named "White Rose I," was dam of "White Rose II," the champion Ayrshire at the Highland Show in 1900, first at Kilmarnock and Glasgow, and Derby winner at Ayr and Galston in 1899.

It is not necessary, in view of these victories, to insist further on "Bute of Burnhouses'" right to be regarded as a famous Ayrshire sire, or to justify an expression of regret that he was used so sparingly.

Many other sires of similar, but not of such distinguished, reputation might be named, as, for example, "Yellow Chief" (2433), bred by Mr Abram Kerr, for long in use at Mid Ascog and elsewhere, but only one more of the "vessel" bulls of modern date will be referred to with some fulness of detail.

"Duncan Gray" (3252).

This bull, white with a few dark spots, calved in 1893, and bred at Burnhouses, has bred stock which has attracted a great amount of attention in the showyard. He was owned during most of his history by Mr George Alston, Loudounhill, and it is in that part of Ayrshire that his stock are most numerous. Amongst them have been "Nelly Gray," unbeaten as a three-year-old in calf in 1897, and winner of the £50 cup at the Highland Show that year; "Juniper 14th," first in Ayr Derby, and first as a three-year-old in milk at Ayr in 1897, and first as a four-year-old in milk at Glasgow, and winner of the £25 cup then, as well as second as cow in milk at Ayr in 1899; "Hover-a-Blink I.," first as a three-year-old at Kilmarnock, first in Galston Derby, and first as quey in milk at Galston in 1898, first and champion at Barrhead in 1899.

Several of the bulls bred at Drumlanrig were notable sires, and left stock above the average in the district of Loudoun. Of these might be named "Baron" (245), a greyish-white; "Baron II." (337), calved in 1881, a successful sire; and "Baron IV." (1810), bred at Knockdon, but of the same race.

Mr Drennan, Hillhouse, Galston, who has swept the boards

at Ayr for the parish group in his time, was indebted to these and others, but especially to the bull "Never Mind Him," for that success. He also had use of "Peter of Whitehill," and "Sloth of Hillhouse" (3396), which was bred at Burnhead, and proved a "great breeder."

The great show bull about the year 1878 and onwards, when our own acquaintance with Scottish shows first began, was Mr William Bartlemore's

"Baron o' Buchlyvie" (281).

This bull (fig. 63) was calved in 1877, and bred by Mr Duncan Keir, Buchlyvie. He was white and brown in colour, and after he was two years old, unbeaten. His career in the showyards was phenomenal, and his type, although not for some



Fig. 63 — AYRSHIRE BULL, 'BARON O' BUCHLYVIE' (281).

Bred by Mr Duncan Keir, Buchlyvie

years past in favour, was much more profitable when the butcher came to be consulted, as he must at the finish, than the type so greatly in favour since the time of "Wattieston Prince." "Baron o' Buchlyvie" was a bull of great scale and substance, with a good top and bottom line, and plenty of flesh when the end had come. He was without doubt, one correspondent says, one of the

best breeding bulls ever known in Strathendrick, and the racy correspondent from whom a quotation has already been made, although no lover of the "yeld stock" kind, says, "'Baron o' Buchlyvie' helped to improve yeld stock, but did nothing for vessels." This may be so, but it was no inconsiderable merit as a sire that he is acknowledged to have improved the stock in other respects. The general impression in some quarters is that the great "Baron" did nothing but win prizes; it is valuable to learn from those who knew him best that his title to fame rests on a broader foundation. His son, "Baron of Ox-hill," was bred by the late Robert Macfarlane, Oxhill, Buchlyvie, was frequently shown, and only once beaten. He was sold at a long price to go to New Zealand, where he was never beaten. The sire of the "Baron o' Buchlyvie" was "Borland," and although not known in the showyards like his son, was one of the best breeding bulls in the district where he was best known.

"Knowsley" (325).

This bull, whose portrait is probably known to a good many readers, was calved in 1878. He was bred and owned for several years by Mr Andrew Montgomery of Netherhall, when he farmed Boreland, and was sire of the dear youngsters at the dispersion sale of that herd in 1883. "Knowsley" was a very handsome bull, very dark brown or almost black in colour, but with some white. His stock exhibited the same fine characteristics of style and good commercial qualities, and the prices realised at the Boreland dispersion sale were much above the average. Mr Andrew Mitchell, Barcheskie, Kirkcudbright, afterwards became owner of the bull, which bred very well indeed in his herd.

Somewhere between the years 1868-73 Sir Michael R. Shaw-Stewart, Bart., Ardgowan, Greenock, and Mr Robert Wilson, then in Forehouse, now in Manswraes, were owners of a pair of fine bulls which competed against one another. Sir Michael's was named "Ardgowan," and won first at the Highland Show at Edinburgh in 1869. He was then three years old, and his breeder was Mr J. Wardrop, Burnbank, Loudoun. He was a very dark-brown bull with little white, not of the largest size, but a great showyard favourite on account of his evenly balanced quality. Mr Wilson's was a big long bull named "Adino," marly-white in colour, with small light-red spots. He generally stood second to the Ardgowan bull, but probably was the better breeder of the two. His dam was a celebrated cow named "Mearns," with which Mr Wilson won first at the Highland Show at Glasgow in 1867, in calf, and again at the same Show at Aberdeen in 1868, in milk. Both she and her

son were bred by Mr Harvie, Cairn, Newton Mearns. Mr Wilson from first to last showed many good Ayrshires of both sexes.

The Atholl Herd.

It would be unpardonable to conclude this sketch without reference to the fine herd of Ayrshire cattle kept since about the year 1860 by the late Duke of Atholl, afterwards by the late Duchess-Dowager of Atholl, and now in the hands of their trusted manager, Mr J. J. Gillespie, the tenant of St Colmes,



Fig 64 — AYRSHIRE COW, "COLLYHILL"
Bred by Mr John Craig, Collyhill, Strathaven Tannahill

Dunkeld The first mention of this herd occurs in the records of the Highland and Agricultural Society for the Perth Show of 1861. The Duke then exhibited the fine cow "Collyhill," bred by Mr J. Craig, Collyhill, Strathaven (fig. 64), which had a remarkable showyard career, and went to the Battersea Exhibition in 1862. For a good many years after this the Duke and then the Duchess-Dowager were successful exhibitors at the National Show. Buccleuch bulls from the Drumlanrig herd were generally in use in later years, and have moulded the form of the present herd. Three of these may be named—"Kenmore of Dunkeld" (340), calved in January 1879, a large handsome red bull which

left much valuable commercial stock; "White Prince of Dunkeld" (1212), a white bull with red spots, calved in 1885, and a grandson of the great "White Prince" (63), or the Company bull; and "White Duke" (1213), calved in the same year, of almost the same colour, and another grandson of the "White Prince" (63). All three had a marked effect on the herd, and left fine commercial dairy cattle. The last highly-bred bull purchased was "Snowstorm of Munnoch" (2191), calved in 1890, a handsome white bull, which left good milking stock, with style and gaiety.

How much further this list might be extended is unknown. As far as possible, and as is known to us, we have endeavoured to write of sires which are known to have left an impression on the breed, to indicate what is the prevailing sentiment regarding that impression amongst breeders of all shades of opinion, and to avoid any reference to living sires. It is possible that in respect of this last we may not have been successful—that some living sires are referred to, and some with an equal right to distinction not so. If such should be the case, perhaps those who feel aggrieved, and justly so, will kindly put down our omissions to ignorance and not to culpable intent.

SHEEP-FEEDING EXPERIMENT AT MAINS OF AIRLEYWIGHT.

By Dr A. P. AITKEN, Chemist to the Society.

THE experiment of which this is a report was undertaken by Mr William Hutcheson at the request of the Society, partly to confirm and partly to supplement the results of the experiment carried out the previous year by Mr M'Caig at Challoch, Leswalt, and reported in the 'Transactions,' 1900, pp. 23-46, and the results of which are contained in the tabulated statement, Table X. p. 198.

The object of this, as of several previous experiments, is to acquire more definite information regarding the feeding value of some of the ordinary feeding-stuffs now so much used in fattening stock, and concerning whose feeding value there exists great difference of opinion among farmers, and at the same time to test on a large scale the practical value of the knowledge that

has been acquired by means of what may be called laboratory experiments regarding the science of feeding.

One of the results of the former experiment was to establish the superiority of dried grains and the inferiority of oats, as a by-fodder for sheep, when consuming turnips during the winter. The latter fact has been so clearly proved that it was not thought necessary to repeat the experiment; but as regards dried grains it was open to question whether the beneficial and economical results obtained by the use of that by-fodder were not in a great measure due to the fact that no hay was given to the sheep on the turnip break, and that the dried grains rendered hay less necessary, and being a somewhat bulky fodder, supplied to some extent the dry feeding required to counteract the wetness of the turnips.

In the south of Scotland—in the district where Mr M'Caig's experiment was carried out—no hay is ever given to sheep while feeding on the turnip break, whereas in Perthshire, where the present experiment was conducted, the practice of hay-feeding is almost universal. Why the practice should be so different in the two districts is not known, but it was considered desirable to have a somewhat similar experiment to Mr M'Caig's tried upon a farm where hay was fed along with turnips.

Another reason which rendered this further experiment desirable was the unexpected failure of linseed-cake to prove a useful feeding-stuff at Challock during a large part of the feeding season. It was considered that the cause of the failure was probably due to the highly nitrogenous character of the cake, or to some property associated therewith, and that the quantity given at first was in excess of what the sheep were able to digest. Accordingly on this occasion the kind of linseed-cake used was of more normal quality, and in order to test the advantage of giving hay along with by-fodders two lots were fed on linseed-cake, one with hay in addition and one with none.

The experiment was conducted on a high-lying field of light loamy, well-drained land, growing a good healthy crop of yellow turnips.

The feeding-stuffs used were those which Mr Hutcheson had already laid in as his winter supply, and which he was accustomed to mix in various ways, believing, as most feeders do, that a mixture is better than any one by-fodder. The mixtures used throughout the country vary much; it may be according to experience, but generally with no definite reason except perhaps the notion that there is safety in mixtures, and the expectation that if any one of the ingredients should fail in its effect the others may make up for the deficiency. There is a great want of reliable information on this subject, and it is only by multiplying experiments such as this that it can eventually be obtained.

Plan of the Experiment.

The plan of this experiment was as follows: Seven lots of 20 sheep each were selected, and that was as much as one man could conveniently feed and care for, and one of them was fed on turnips and hay without any extra feeding, in order to serve as a gauge of the value of the various by-fodders, viz.:—

Lot.

1. Turnips and hay.
2. " " along with undecorticated cotton-cake.
3. " " along with a mixture of undecorticated cotton-cake and crushed maize.
4. " " along with crushed maize.
5. " " along with dried distillery grains.
6. " " along with linseed-cake.
7. Turnips and linseed-cake, but no hay.

Analyses of all these fodders are given in the appendix to this report, Tables XI., XII. p. 198, from which it will be seen that they are all of good average quality except the dried grains, which is low in albuminoids. The undecorticated cotton-cake contained less than usual of the husk of the cotton seed—it was partly decorticated—but it and the dried grains differ from the other by-fodders in containing a good deal of what is known as woody fibre, which differs according to circumstances in its woodiness and in its digestibility. In the cotton-cake, consisting as it does of the hard husks of the seed, it is very indigestible, but it contains a bitter principle that serves a useful purpose. In the dried grains and hay it is much less woody, and when consumed by sheep is just as digestible as the carbohydrates, or even more so.

The sheep used for the experiment were a lot of 185 grey-faced hogs (blackfaced Leicester cross) bred by Captain Campbell of Middleton, Blairgowrie. From these 160 were selected and divided into seven lots of 20 each, and a reserve of 20 to make good any casualties that might occur. Of these there were eleven altogether. As soon as a sheep died or had to be removed on account of illness or accident one of the reserve was put in its place so as to simplify the weighing out of the fodders, but these added sheep were not taken account of in the progress of the experiment nor included therein.

Different Fattening Periods.

The experiment began on 10th December 1899 and continued until the 24th March 1900—a period of fifteen weeks—when it was found that all lot 7 and also a number of individuals belonging to other lots were fat. These were accordingly

withdrawn and sent to the butcher, Mr Roy in Perth, who along with Mr Hutcheson superintended the weighing of the carcasses. A second draught was made at the end of the next week (31st March), and those that were still unfinished were kept for a fortnight longer (17th April), when the whole experiment ended.

In Table I. are given the number of sheep taken from each lot on the three occasions.

TABLE I

Lot		Fat, March 24.	Fat, March 31	Fat, April 17	Total
1	Turnips and hay alone	0	0	19	19
2	" " with cotton-cake	3	10	7	20
3	" " with half cotton cake and half maize	1	16		17
4	" " with maize	6	5	8	19
5	" " with dried grains	8	10		18
6	" " with linseed-cake	9	10		19
7	Turnips and linseed-cake (no hay)	17			17

In the last column is shown the number of survivors at the close of the experiment. Two lots lost three sheep each, one lost two, and three lots lost one each, and only one lot remained without accident; but as these losses had nothing to do with the feeding they need not be further considered.

It is seen that lot 7, with no extra feeding but linseed-cake, was the first fat, and lot 1, that got no by-fodder, was the last, if not to be fat, at least to be ready for the market. At the end of the time (April 17) these were still making progress, but the supply of turnips was giving out and the proper time for feeding was over. The maize-fed lot, No. 4, was also backward, and so was the cotton-cake lot, No. 2, but in both these lots the residue made good progress during the last fortnight. Lots 3, 5, and 6 were considered finished on 31st March. The rapidity with which a fodder brings animals to maturity of fattening is an important matter, not only in saving one or more weeks' keep, but it may be in obtaining a better market; but in the case of young animals, such as those used in this experiment, a certain amount of growth is expected, and a by-fodder which makes frame as well as fat may be more economical, although it prolongs by some weeks the attainment of maturity.

The cotton-cake lot and the maize lot were slow to mature, and possibly they were increasing in size; but lot 3, fed on a mixture of these, were considered ripe a fortnight earlier. Whether they were really fat on 31st March is somewhat doubtful, for mere handling is not a perfectly accurate means

of determining whether or not an animal is prime fat, and it may be that lot 3 would have put on a satisfactory increase if it had been left for a fortnight longer along with its neighbours 2 and 4. When lots 2 and 4 were weighed a fortnight later, it was found that they had increased at an extraordinary rate—from 3 to 4 lb. per week—but evidently much of that increase was due to the damp state of the fleeces, for there had been a good deal of wet weather in the meantime.

Mr Hutcheson kept a record of the maximum and minimum temperature every two or four hours during the whole course of the experiment, and also measured the rainfall and noted the weather conditions in order to determine to what extent these factors influenced the progress of the stock and the amount of the various fodders consumed (see Table XXIII. p. 205).

The sheep were allowed to eat as much turnip and hay as they liked, but the by-fodders were given in definite quantities, and all in the same measure—viz., $\frac{1}{2}$ lb. per head during the first four weeks, $\frac{3}{4}$ lb. during the next eight weeks, and 1 lb. per head thereafter, and all the lots consumed their entire quantity of by-fodder daily during the whole time.

The sheep were weighed individually on four occasions—viz., 9th December, when the experiment began, 16th January, 26th February, and 24th March. Had it been possible they would have been weighed every four weeks, but in the case of sheep feeding in the open the occurrence of wet weather makes that impossible, and one has to watch for a convenient opportunity when a few consecutive fair days have rendered the fleeces comparatively dry.

Individual Peculiarities.

The weights of the individual sheep on the above dates are given on Tables XVI.-XXII. pp. 202-205, and also their increase in live-weight during each of the three periods, as well as their total increase. These tables in their extended form are not very attractive to look at, but they convey some very useful information, and deserve more than a passing notice. It is seen that some of the sheep were bad doers, and in an experiment where the comparative value of by-fodders is being tested they might reasonably be left out of account. Nos. 3 and 13 in lot 1 and No. 15 in lot 6 are of that kind; but seeing that there are about 20 sheep in each lot, and that in each lot there are some that have done remarkably well, we shall not be far wrong in taking the lots as we find them with good and bad together.

The individual weighings are seen to show extraordinary variations, and afford a striking illustration of the necessity for

employing a large number of sheep in each lot where comparative feeding experiments are concerned. There were very few cases of two sheep in any of the lots finishing exactly alike, and where that did occur their progress was different. Some did better at the beginning, some appeared to do better in the middle, and some towards the end of the 105 days embraced in the experiment up to the 24th March, when the first batch of fat sheep were sent away. The weighings at that date show so wide a range of difference in the progress of the individuals of each lot that it is instructive to note what the differences were. On Table II. are given the range of difference in the individuals of the various lots.

TABLE II.

Lot		Increase during 105 days		
		Lowest	Highest	Average
1	Turnips and hay	6	36 5	22 1
2	" " with cotton cake	24	50	36 4
3	" " with cotton-cake and maize	31 5	47 5	38 2
4	" " with maize	22	45	34 8
5	" " with dried grain	26	54	39 0
6	" " with linseed-cake	15	50	38 3
7	Turnips and linseed cake (without hay)	24	50	37 4

It may be said in a general way of those lots that got by-fodders that the individuals that did best made fully twice the progress of those that did worst.

In the case of individuals a difference of 2 or 3 lb. up or down might occur from the greater or less amount of their evacuations just before weighing, but in the case of about 20 individuals that is a matter which equalises itself. The differences in the present instance are so great that they must be accounted for chiefly by the individual peculiarities or feeding qualities of the different animals.

The lot which showed the greatest variation in the progress of the individuals was lot 1, that got no by-fodder, and it would seem that the giving of some by-fodder has an equalising effect, by improving the condition of the bad doers. The evenest of the lots was No. 3, that had the most mixed dietary, and it is probable that that may be one of the advantages of a mixture: for one part of the mixture may be of a kind to suit some individuals best, and other parts of it may suit others best, and it is very likely that appetite may be stimulated or digestion improved by the presence in the food of one of the constituents more than the rest, but that constituent may differ

according to individual peculiarities, or idiosyncrasy as it is called—a factor of no mean importance in dealing with the living animal.

TABLE III — AVERAGE LIVE-WEIGHTS AND AVERAGE INCREASE IN LIVE-WEIGHT PER HEAD OF THE SHEEP OF EACH LOT IN THE COURSE OF FIFTEEN WEEKS.

Lot		Dec 9	January 16	February 26		March 24		Average increase	
		Weight	Weight	Increase 38 days	Weight	Increase, 41 days	Weight	Increase, 26 days	Total
		lb	lb	lb	lb	lb	lb	lb	lb
1	Turnips and hay	90 4	90 5	10 1	99 4	9 0	102 5	3 0	22 1
2	" " with cotton cake	81 0	96 5	15 5	110 5	14 0	117 4	6 9	36 4
3	" " with cotton cake and maize	77 5	93 5	15 7	106 5	13 0	116 0	9 5	34 2
4	" " with maize	74 5	97 0	17 5	106 6	9 6	114 3	7 7	34 8
5	" " with dried grains	80 5	99 3	18 8	108 0	8 7	119 5	11 5	39 0
6	" " with linseed cake	79 7	98 3	18 6	107 6	9 3	118 0	10 4	38 3
7	Turnips and linseed cake (no hay)	80 7	98 7	18 0	111 2	12 5	118 1	6 9	37 4
Average increase in each period				16 6	10 7		8 0		

So as to give a good general view of the progress of the experiment the collective results of Tables XVI-XXII. have been brought together in Table III., showing the average live-weights of the sheep of each lot, and the average increase per head during the three periods, and the total and weekly increase of each lot during fifteen weeks. But the average increase per head during each of the three periods does not give a clear view of the actual daily or weekly progress made by each of the lots, for the three periods were of very different durations—viz., 38, 41, and 26 days respectively. The progress during the third period looks less than during the second, though in reality it was much greater. In Table IV. is given the progress per head *per week* during each of the three periods, and as these did not each consist of a definite number of weeks, the figures indicating the weekly increase are got at by finding the daily increase and multiplying by seven.

TABLE IV.—AVERAGE INCREASE PER HEAD PER WEEK
DURING THREE PERIODS.

Lot		1st period, 38 days.	2nd period, 41 days.	3rd period, 26 days.
1	Turnips and hay	2.00	1.52	70
2	" " with cotton cake	2.89	2.59	1.87
3	" " with cotton-cake and maize	2.90	2.10	2.80
4	" " with maize	3.21	1.70	2.01
5	" " with dried grains	3.48	1.50	3.29
6	" " with linseed-cake	3.48	1.62	2.61
7	Turnips and linseed cake (no hay)	3.44	2.00	1.85
Average		3.06	1.86	2.16
" excluding lot 1		3.23	1.92	2.40

During the first period of fully five weeks the weekly increase was very satisfactory. In none of the former feeding experiments with sheep was the progress so rapid. An increase of 2 lb. per head per week was regarded as very good progress, but, in this case, that was attained during the first five weeks by the lot that got nothing but turnips and hay, while the lots receiving by-fodders in addition increased during the first period at the rate of $3\frac{1}{4}$ lb. per week, during the second at nearly 2 lb. per week, and during the third at nearly $2\frac{1}{2}$ lb. per week. This rapid increase may be accounted for in several ways. In the first place, the weather conditions, though severe enough sometimes, were much more favourable than those of the former winter, when storms of cold wind for days together drove the sheep from their feeding-boxes. The kind of stock was the same on each occasion, but it may be that those used on the present occasion were of a better feeding strain.

Importance of good Turnips.

I am of opinion, however, that it is to the superior quality of the turnips that we must chiefly look for the greatly enhanced progress. Mr Hutcheson's turnips contained 10 per cent of solids, and 13 per cent of that consisted of nitrogenous constituents, the half of which was albumen. Mr M'Caig's turnips contained $9\frac{1}{2}$ per cent of solids, but of that only 9 per cent was nitrogenous matter, the half of which was albumen; and though Mr M'Caig's sheep consumed nearly 2 lb. per head more of turnips per day, that did not suffice to compensate for their inferior quality.

During the second period of about six weeks the rate of progress was much slower, despite the fact that the by-fodders had

been increased from $\frac{1}{2}$ lb. to $\frac{3}{4}$ lb. per day. It is to be expected that store animals when they are put on to a more nutritious and liberal diet will make most progress at first, but a sudden retardation such as this is due to some special circumstance.

Effect of Severe Weather.

It will be noticed on Table XXIII. of the appendix that very severe weather prevailed during the latter half of the period. Storms of snow and rain were frequent, and for some days the turnips were frozen, and a considerable drop took place in the amount consumed, and probably the stock fell back in condition. Those that were most affected by the change were those that had previously made greatest progress, especially the dried-grains lot, No. 5, though lots 6 and 4 were not much better. The lots that suffered least were the cotton-cake lot, No. 2, and its neighbour, No. 3, half of whose by-fodder was cotton-cake. It is curious to notice that during the third period some of the lots fell off in their rate of increase, while others recovered lost ground and progressed very rapidly. The lot that did worst in the third period was lot 1, that had no by-fodder. They did not make half the increase per week made during the former period. Lot 2, fed on cotton cake, also were backward after having come through the stormy weather better than all the other lots; and strange to say, its neighbour, fed on half cotton-cake and half maize, picked up rapidly, and increased 1 lb. a-week per head better than it. An unexpected result of a similar kind occurs in the case of lots 6 and 7. The former made poor progress during the second period, but advanced rapidly in the third; while the latter came through the stormy period fairly well, but progressed more slowly thereafter. The probable explanation in this case is that lot 7 were already nearly fat in entering the third period, which would sufficiently account for the slight falling off in their progress towards the end. The lot that lost most ground during the bad weather was lot 5, fed on dried grains, but during the third period it advanced with double speed and made more progress than any of the others. Before trying to account for the peculiarities in the progress of the various lots we must first see how they fed during the time, for the quantities of turnips and hay consumed by the different lots show considerable differences, as is seen by Table V.

TABLE V.—TURNIPS AND HAY CONSUMED PER HEAD PER DAY DURING THREE PERIODS.

<i>Turnips.</i>					
Lot		5 weeks ending Jan 13	6 weeks ending Feb 24	4 weeks ending March 24	Average during 15 weeks
		lb	lb	lb	lb
1	No by fodder	14·2	13·7	16 5	14·7
2	Undecorticated cotton cake .	13·9	13·0	16 0	14 1
3	Do. and maize (mixed) .	13·4	11·4	14·0	12 9
4	Maize	13·4	10·0	11·3	11 5
5	Dried grains	13·3	11·7	13·3	12 7
6	Linseed-cake	13·2	11·8	14·2	12·9
7	Do. (without hay) . . .	13·2	11·8	13 6	12·8
	Average for period . . .	13·5	11·9	14·1	

<i>Hay</i>					
1	No by fodder	·76	63	66	·68
2	Undecorticated cotton-cake .	·54	·38	·52	·47
3	Do. and maize (mixed) .	·54	47	·53	·51
4	Maize	·51	45	·64	·52
5	Dried grains	·53	31	39	40
6	Linseed-cake	·58	·47	·47	50
7	Do (without hay)	none	none	none	none
	Average for period	·57	46	53	

It is seen that lot 1, that got no by-fodder, consumed most turnips and also most hay, a natural thing to expect; but, nevertheless, it is in marked contrast to that in Mr M'Craig's experiment, where the lot feeding on turnips alone consumed least turnips, much to the surprise of those who took an interest in the experiment

Consumption of Turnips.

Contradictory as these results are, I think they are capable of explanation. The swedes at Challoch, as already mentioned, were of rather poor quality, and presumably not very appetising, especially during the cold boisterous weather that prevailed,

so that the other lots that got dry by-fodders were able to tolerate a larger diet of turnip. In the present instance the hay given along with the turnips supplied the dry fodder required to make the wet turnips agreeable, to use a general term; but whether that agreeableness was due to the inward amount of heat supplied by the consumption of the hay or to the improved digestion brought about by the increased secretion of saliva and the concomitant increased secretion of gastric juice in the chewing of the dry fodder and rumination thereafter, or to all combined, or perhaps to some less obvious reason, is an interesting physiological problem.

The next thing to notice is that lot 2, fed on undecorticated cotton-cake, consumed nearly as much turnips as lot 1, and fully 1 lb. per day more than any of the other lots that had by-fodders. It may be that some quality, such as the large proportion of woody fibre in the undecorticated cotton-cake, induces sheep to eat more turnip matter, but there are no former experiments with which to compare it, as that by-fodder was used experimentally for the first time on this occasion. The lot that consumed least turnip was lot 4, fed on maize, and the same thing occurred with Mr M'Caig's sheep in the previous experiment. The diminution in the amount of turnip consumed by the maize-fed sheep is so considerable and so well marked in both experiments as to make it pretty certain that these two things are related as cause and effect.

Consumption of Hay.

As regards the amount of hay consumed, Table V. shows that lot 1, that had no by-fodder, consumed, as was to be expected, the greatest amount of hay, but the additional quantity was less than one-fifth of a pound per day—nothing like sufficient to compensate for the want of the by-fodders, which were given at the rate of from $\frac{1}{2}$ lb. to 1 lb. per day. The greatest amount of hay that sheep could consume along with turnip could not contain more than a fraction of the nutriment contained in the by-fodders. The lot that consumed least hay was lot 5, fed on dried grains. That also was expected, for the bulkiness of that by-fodder, the amount of woody fibre it contains, and its character generally, approaches more nearly the character of hay than any of the other by-fodders.

We are now in a position to consider more satisfactorily the progress made during the three periods, as shown on Table III. As a general result it is seen that the sheep increased in weight during the first five weeks about as much as they did in the next ten. On comparing these results with those of the previous year at Challoch (see p. 198), in so far as they are comparable,

it is apparent that in both cases the sheep fed on dried grains did best, so that we may regard it as proved on sufficient evidence—for it was attested also by former experiments—that dried grains take a first, if not *the* first, place as a by-fodder for sheep.

There are Grains and Grains.

The superiority of dried grains in this experiment is not so conspicuous as in Mr M'Caig's, and that is a circumstance that may be accounted for in two ways. The giving of hay may have shared in some measure the characteristics of the grains, thereby obscuring the distinctive effects of the latter, but the chief cause is doubtless to be found in the inferior quality of the grains used on this occasion. It was not bought in for the experiment, but was a supply which Mr Hutcheson had at his farm and for which he had a contract. It contained, as shown on Table XI. p. 198, only about 16½ per cent of albuminoids, while a good sample should contain about 20 per cent. The grains used by Mr M'Caig were a quality known as "general feeding grains," and the analysis showed that it contained 19¼ per cent of albuminoids. So great a difference in what is, in the circumstances in which it was used, the most valuable part of the feeding-stuff, may easily account for the less favourable effect of the grains in this experiment.

Linseed-cake.

Next in order of merit of the feeding-stuffs comes linseed-cake (lot 6), which did so badly with Mr M'Caig. The failure of the linseed-cake on that occasion came as a great surprise, and the only explanation that seemed feasible was that the kind of linseed-cake he used was too rich in albumen. It contained about 35 per cent of albumen, while that used for this experiment contained less than 30 per cent, as is usually the case with linseed-cake. It is satisfactory to find that on this occasion linseed-cake maintains its high reputation as a by-fodder, and its failure in the former experiment during the early part of the feeding season may usefully be regarded as a warning against using a linseed-cake so rich in albumen except very sparingly—say ¼ lb. per head per day—until the stock get accustomed to it, and then increasing it very slowly. On this occasion the sheep did well with the linseed-cake at the rate of ½ lb. per day from the first. When the quantity was increased to ¾ lb. per day they still made good progress, but when during the last three weeks the quantity of the by-fodders was increased to 1 lb. per day, it is doubtful if any of the lots except lot 5, getting dried grains, benefited by the increase.

Hay and no Hay.

A comparison of the progress of lots 6 and 7, both of which got the same quantity of linseed-cake, is of much interest. Lot 6, in addition to turnips and cake, got as much hay as they cared to eat, which amounted on an average to about $\frac{1}{2}$ lb. per head per day, but lot 7 got none. Lot 7 was added on to the others for the express purpose of discovering whether there was any advantage in giving hay to sheep that were feeding during the winter on turnips and cake, and if so, wherein the advantage lay. As has been said, it is the practice in Wigtownshire to give no hay, as it is considered quite unnecessary, whereas in Perthshire it is the practice to give hay as well as cake, and I am informed that stockowners there would never think of bringing their hoggs through the winter without hay. This sharp difference of opinion and practice invested the progress of lots 6 and 7 with considerable interest.

Hay does not reduce Consumption of Turnips.

One would naturally expect that one of the results of giving hay would be to diminish to some extent the consumption of turnips, but in this case, as is shown on Table XIII., it did nothing of the kind. The two lots consumed exactly the same amount of turnips, so that the hay eaten by lot 6, amounting to fully $\frac{1}{2}$ lb. per head per day, was simply an addition to their dietary. During the first five weeks or so there was a slight difference in favour of the hay-fed lot, but during the next period of six weeks the lot that got no hay did far better, so that after eleven weeks they had increased $2\frac{1}{2}$ lb. per head more than their hay-fed neighbours. During that time lot 6 had consumed altogether about 800 lb. of hay, and seemed to be not a bit the better for it. This is a most unexpected result, and it ought to be capable of satisfactory explanation, for with so many sheep under experiment it will not do to pass it by as an anomaly or an accident. One of the advantages claimed for the practice of giving hay as an adjunct to turnips during winter is that it provides sheep with an acceptable fodder during cold stormy weather when turnips are frozen, and prevents their losing ground, as they are apt to do despite their being cake-fed.

This experiment gives no support to that theory, for it will be noticed that it was precisely during the cold stormy weather of the second period, when the turnips were sometimes frozen, that the progress of the hay-fed lot was slower than the other. The only explanation I can offer is that the sheep of lot 7 were in fatter condition when the cold stormy weather came on, and were therefore better protected against cold.

Speed of Fattening.

I visited Airleywight on 10th March, about a fortnight after the end of the second period, and along with two experienced cattle-salesmen, whom Mr Hutcheson had invited to meet me, we handled all the lots very carefully, and though I do not presume to regard my handling as of much account, I was convinced of the correctness of the opinion expressed by the others, that lot 7 was the fattest of all; and it was the opinion of the salesmen that the whole lot, with the exception of one or two individuals, was quite fat and ready for the market. The result of the next fortnight's feeding proved that they were right, for it is evident from the weighing on 24th March that the sheep of lot 7 had made scarcely any further progress, and had the experiment been brought to a close at 10th March lot 7 would have been the best of all. That lot, however, was kept for another fortnight so that the sheep might be weighed along with the others, having their fleeces in a similar condition to theirs as regards moisture.

Effect of Hay Feeding.

It will be noticed that the result of that extra fortnight's feeding was to enable lot 6 to overtake its rival, so that when weighed on 24th March the two lots were of practically the same average weight—viz., 118·0 and 118·1 lb. per head. But as lot 6 started on 9th December 1 lb. per head lighter, they showed a gain of 1 lb. per head as the result of a consumption of 53 lb. per head of hay. It would seem, therefore, that there is something to be said for both sides of the hay-feeding question. The lot that got linseed-cake and no hay were first fat, so that they were ready for the market a fortnight or three weeks earlier than those that got hay in addition to linseed-cake; but the effect of the hay-feeding, while it retarded the fattening process, was to produce in the end a somewhat heavier sheep, so that while lot 7 were putting on fat, lot 6 were building more frame or flesh capable of carrying more fat in the end—and it will be shown that lot 6 did eventually produce more carcass than lot 7, though they took perhaps three weeks longer to do it.

The building up of a bigger frame or the putting on of more flesh for future fattening is probably also what was going on in the case of lots 2 and 3, that were a little backward at first. It may be that the less oily by-fodders, such as undecorticated cotton-cake and maize, tend to cause the putting on of flesh rather than of fat; but that is not a point that can be proved without the adoption of special arrangements that were not included in this experiment.

The cotton-cake and the maize were given by themselves to lots 2 and 4, and also as a mixture to lot 3, and the latter is seen to be somewhat better than either separately. It is Mr Hutcheson's practice to feed with a mixture of undecorticated cotton-cake and maize, believing it to be quite as good in its effects as linseed-cake and much more economical, and certainly the results of this experiment give support to his opinion. It would be a very useful supplement to the feeding experiments hitherto undertaken for the purpose of determining the relative value of the commoner concentrated fodders, if further experiments were made with such fodders not given during the whole time but in successive months during the feeding season, and also with mixtures of them.

Mixed By-fodders.

Mixed cakes and meals are much used by some feeders, and are preferred to single substances. Some of these mixed fodders contain a great variety of feeding materials, and have been found very efficient. They are sold under a great variety of names, and naturally the makers do not disclose their composition; but it would be an instructive thing, both to feeders and cake merchants, if methodical experiments were undertaken to extend our knowledge regarding the value of feeding mixtures composed of substances that are in the market and available to all. There would still be a wide enough field for the exercise of the skill of cake manufacturers in the judicious employment of many useful waste materials derived from the milling of grain, and from other industries concerned with the manufacture of food products.

The maize-fed lot—No. 4—were somewhat backward. They made good progress at first, just as they did in Mr M'Caig's experiment, but they did not continue to progress so satisfactorily as the others. It became less effective as the fattening proceeded, and the cause is to be found in the composition of the feeding-stuff. It is seen from Table XI. that it contained less albumen and less oil than the other by-fodders, but more carbohydrates; and it is evident from this, as from the former experiment, that its place as a by-fodder is at the beginning of the feeding season, and that as fattening proceeds it should be supplemented by or give place to a stronger feeding-stuff, such as linseed-cake.

It will be seen on Table III. that lots 3 and 4 were 2 to 3 lb. per head lighter than the others at the start, and as that might probably affect their position at the end of the experiment and the conclusions derived therefrom, I considered it desirable to discover whether the lighter sheep or the heavier ones of each

lot made the greater increase. Taking the ten lightest and the ten heaviest of each lot, and comparing their average weight at the beginning and at the end of the fifteen weeks, I find that the lighter half added on an average 44 per cent and the heavier half 38·7 per cent to their original live-weight. The difference was most marked in the increase of the members of lot 3, where the lighter half became half as heavy again and the heavier half became only about one-third as heavy again as at the start. In Table VI. are given the percentage gains of the two classes in each lot, as they may be of some interest. It is

TABLE VI.—GAIN IN LIVE-WEIGHT OF THE LIGHTER AND HEAVIER SHEEP IN EACH LOT.

	Lighter per cent	Heavier per cent
1. Turnips and hay	31	23
2. " " and cotton-cake	48	43
3. " " " " and maize	50	32
4. " " and maize	44	42
5. " " and dried grains	36	47
6. " " and linseed-cake	54	40
7. Turnips and linseed-cake (no hay)	45	44
Average	44	38 7

evident that the lighter sheep owed that circumstance not to their being of smaller stature or to their being worse feeders, but simply to their being in leaner condition; and it is probable that lot 3, eating a mixture of cotton-cake and maize, owed its increased rate of progress over lots 2 and 4, that were fed on these substances separately, simply to its containing a larger proportion of leaner individuals at the start rather than to the superior feeding properties of the mixture.

On 24th March all lot 7 was sent away as fat, and they might more advantageously have been sent away a fortnight earlier; about the half of lots 5 and 6 went with them, as has already been shown on p 179. The rest were kept for a week, and in some cases for three weeks longer, until they were ready for the market. The fact that lot 7 was kept longer than necessary, and that the other lots had a more or less prolonged time to fatten towards the end, when the by-fodders were given at the rate of 1 lb. per head per day, reduces of course the value of the final carcass-weights.

Previous experiments have shown that where so many as 20 sheep per lot are used, and the whole experiment brought to an end on the same day, the live-weights and the weight of carcass of the various lots were in comparative harmony and told the same story, so that the results of the experiment so far as feeding progress was concerned might be fairly satisfactorily gauged

from the live-weights. The live-weights of the remainders sent away on 31st March and 17th April were taken, but as their fleeces were evidently in a damper state than those of the previous lots, thereby giving the residues of lots 1, 2, and 4 an apparent increase of several pounds per head, it would lead to an erroneous conclusion to compare the final live-weights of the different lots. These can be profitably compared only when all the sheep are weighed on the same day, and even then the fleeces must be dry and remain dry during the whole time of weighing. The carcass-weights, however, when the extra amount of feeding and the extra time and labour are taken into account, should show the relative values of the different by-fodders.

The final weights of carcass, tallow, and skins, and the relation of tallow to carcass, are given in the subjoined table; but as the skins were weighed without being dried, a considerable reduction would require to be made in the weights of the skins of lot 1, and also to a less extent in the weights of those of lots 2 and 4.

TABLE VII.

AVERAGE CARCASS-WEIGHTS (AT VARIOUS DATES).

Lot		Dates when killed.	Carcass	Skins	Tallow.	Tallow in proportion to carcass.
			lb.	lb.	lb.	%
1	Turnips and hay	April 17	53 1	13·6 (?)	5 8	10 9
2	" " with cotton-cake	{ March 24 " 31 April 17 }	58 5	15·3 (?)	6 5	11 1
3	{ " " with cotton cake and maize	March 31	57 8	11 3	6 6	11·4
4	" " with muze	{ " 24 " 31 April 17 }	59 1	13·7 (?)	7 1	12 0
5	" " with dried grains	{ March 24 " 31 }	58 2	14 8	5 7	9 8
6	" " with linseed cake	{ " 24 " 31 }	59 3	14 0	6 8	10 6
7	Turnips and linseed cake (no hay)	" 24	58 5	14 4	6 1	10 4

A comparison of the carcass-weights shows that with the exception of lot 1 the differences between the different lots are very slight. Lots 6 and 4 are heaviest, but the half of lot 6 had a week longer to fatten than those of lot 7; and as to lot 4, five of them had a week longer, and eight had three weeks longer feeding, so that their extra pound or so per head is even less than might have been expected from their extra feeding.

Lot 7, considering that they were first killed, and might perhaps with advantage have been killed a fortnight sooner, has finished remarkably well.

As regards tallow, the maize-fed lot have a clear lead, just as the lots fed on oats and maize had in the experiments at Ferneycastle and Whitelaw three years previously. The grain-fed lot have the least loose fat—even less than lot 1, that had no extra feeding. That is an unexpected result; for in Mr M'Caig's experiment last year the grain-fed lot had most loose fat, but, as already explained, they were fed on "general feeding grains" and not on ordinary distillery grains, and that may account for the difference.

Mr Thomas Roy, butcher, Perth, who killed the sheep, was asked to give his opinion of the carcasses of the various lots, and he reports as follows: "The carcasses of the sheep in lot 5 were the best mutton as regards quality, although lot 4 came very close behind them, and were distinguished by having more inside tallow and fat. The carcasses of lot 1, with the exception of two sheep, were wonderfully good, and I am sure that from the consumers' point of view would be regarded as the sweetest mutton of all, although of course they wanted the size and weight of the other lots."

In accordance with an expressed desire to have a kind of balance-sheet drawn up to show as nearly as possible the results of the experiment from an economical point of view, I asked Mr Hutcheson to furnish me with the prices he had paid for the fodder, and the prices he had obtained for the sheep.

As the sheep were not all sold at the same time, and as a rise occurred in the market prices during the three weeks between the sale of the first and last lots, the relative costs are not so precisely brought out as they would have been had the whole of the sheep been killed at the same time and sent to the London market. The prices at Perth were ruling higher than at London when the first batch were sent off, and it would have paid better to have sold them there instead of sending the carcasses to London; besides that, it cost about 3s. a-head to send and sell them there. The first batch consisted of about half of lots 5 and 6 and the whole of lot 7. These lots, therefore, and especially lot 7, do not show so much profit as they ought to do. The rise of price at London followed that at Perth, so that when the last batch was sold, consisting of about one-third of lots 2 and 4 and the whole of lot 1, they fetched from 2s. to 2s. 6d. per head more than they would have done had they been sold three weeks or even a fortnight earlier.

The actual prices obtained for the different batches are given in the subjoined statement supplied by Mr Hutcheson:—

Lot.	Date when killed.	No. of Carcasses.	Price per 8 lb	Total price	Price per head.
1	April 17	19	£ 5 4	£ 29 17 0	31 5
2	March 24 " 31 April 17	3 10 7 — 20	{ 5 4 } { 4 8 } 5 0 5 4	4 17 1 16 5 0 11 18 3 — 33 0 4	33 0
3	March 24 " 31	1 16 — 17	5 0 5 0	1 13 0 24 17 7 — 26 10 7	31 2
4	March 24 " 31 April 17	6 5 8 — 19	5 2 5 0 5 4	9 6 6 8 4 6 14 13 0 — 32 4 0	33 11
5	March 24 " 31	8 10 — 18	5 0 5 0	13 4 7 14 11 8 — 27 16 3	31 0
6	March 24 " 31	9 10 — 19	5 0 5 0	14 4 6 15 17 5 — 30 1 11	31 8
7	March 24	{ 8 9 }	{ 5 2 } { 5 0 }	27 11 8	32 6

In order that the prices per head may be fairly comparable, it would be necessary to deduct, say, 2s. per head from lot 1, and 1s. per head from lots 2 and 4.

We have next to consider the cost of the feeding. The prices at which Mr Hutcheson bought his feeding-stuffs per ton were—

Cotton-cake	.	.	.	.	.	.	£5	0	0
Maize	.	.	.	.	.	.	4	15	0
Dried distillery grains	.	.	.	.	.	.	5	0	0
Linseed-cake	.	.	.	.	.	.	7	6	3

Hay was selling at £4 per ton, and he returned the turnips as worth 10s. per ton, as they were rather scarce that season.

Applying these prices to the quantities of fodder consumed by the various lots, we obtain the results per head as follows:—

TABLE VIII.

Lot.	Cost of fodders per head.				Price got for			Price, minus cost
	Turnips.	Hay.	By-fodder.	Total.	Carcass.	Skins, fat, and offal		
	shillings	shillings	shillings	s. d.	s. d.	s. d.		
1	8·8	3·3	...	12 1	31 5	7 2	26 6	
2	7·5	1·9	3·9	13 4	33 0	7 2	26 10	
3	6·4	2·0	3·6	12 0	31 2	7 2	27 4	
4	5·9	2·3	3·7	11 11	33 11	7 2	29 2	
5	6·2	1·6	3·6	11 5	31 0	7 2	26 9	
6	6·3	2·0	5·2	13 6	31 8	7 2	25 4	
7	5·9	...	5·0	10 11	32 6	7 2	28 9	

If a deduction of 2s. per head is made on lot 1, and 1s. per head on lots 2 and 4 on account of the rise in market price when they were sold, the lot that shows the greatest profit is lot 7, that got linseed-cake but no hay; but if we consider that they were fat, and might have been sold about a fortnight earlier than the others, and that they were all sold from a week to three weeks before the other lots were entirely cleared off, the profit derived from that lot might be considerably more than what is here stated; for there is the saving of nearly a month's labour, and the possibility of obtaining a better market should prices happen to be falling instead of rising, as they were in this instance.

The general conclusions to be drawn from this experiment may be summarised as follows:—

It pays to give sheep some by-fodder along with turnips and hay, but with good feeding turnips the profit is not great.

The giving of a by-fodder shortens the time of fattening, and increases the weight of the mutton (in this instance by 5 lb. or so), but this additional weight is probably got at the sacrifice of flavour.

Sheep fatten sooner upon turnips and linseed-cake than they do when hay is given in addition, and it does not seem that the addition of hay is attended with profit. In this instance it caused a loss of 3s. 5d. per head at least.

A mixture of undecorticated cotton-cake and maize is better than the cake alone, and it is probable that a mixture of feeding-stuffs or a change of feeding-stuff as fattening proceeds is preferable to strict adherence to any one kind of by-fodder.

Dried distillery grains has produced the best quality of mutton, but the advantage it possesses over other kinds of by-fodder is not so apparent in this as on former occasions. This is probably due to the inferior quality of the grains used.

The Nutrient Ratios of the Dietaries.

For the benefit of those who desire to inquire somewhat more minutely into the details of this experiment from a scientific point of view, I have calculated the amounts of the various food constituents consumed, and also those probably digested by the seven lots, and these will be found on Tables XIV. and XV. of the appendix. They take account of the fodder consumed during 105 days—viz., to 24th March, when the first batch was sent away.

It will be seen from an examination of these tables that the progress made by the different lots bears no consistent relation to any of the constituents of the food, nor yet to the organic matter consumed or presumably digested.

In determining the amount of digestible constituents consumed the digestive coefficients given in Wolff's tables have been taken as a basis, except in the case of that of the turnips. For them I have adopted the coefficients arrived at in the experiments conducted for the purpose in the Highland and Agricultural Society's experiments at Mains of Laithers ten years ago—viz., 60 per cent for albuminoids, 90 per cent for carbohydrates, and 85 per cent for woody fibre. The method formerly adopted by the German experimenters of regarding the roots as entirely digestible in themselves, but as exercising a depressing influence on the digestibility of the constituents of the rest of the fodder in increasing ratio as the quantity of roots consumed bulked larger in the dietary, seems now to have been abandoned, and digestive coefficients are now adopted that are very similar to those obtained in the Society's experiments.

From the data given in these tables (XIV. and XV.) we can calculate the nutrient ratio of the whole fodder digested by

the various lots, and these, along with the amounts of fodder consumed and presumably digested, are given in the following table:—

TABLE IX.

Lot.	Live-weight Increase.	Fodder consumed	Fodder digested	Nutrient ratio.
	lb.	lb.	lb.	
1	22.1	250	199	1 : 9
2	36.4	294	220	1 : 6.3
3	38.2	282	219	1 : 7.5
4	34.8	267	218	1 : 9
5	39.0	273	208	1 : 7.3
6	38.3	282	227	1 : 5.3
7	37.4	227	192	1 : 5

It is interesting to notice that lot 7, which fattened soonest, and lot 6, that was not so very far behind it, had the narrowest nutrient ratio in their total fodder; and that lot 4, and especially lot 1, that were slowest to fatten, had the widest nutrient ratio in their fodder. But that is the most that can be said for the nutrient ratio as an index of feeding progress in this experiment. In other respects no consistent relation between the nutrient ratio and the other data is visible. Considering how comparatively widely the nutrient ratio varied, it is remarkable how little difference there is in the live-weights or in the carcass-weights of the different lots, and this quite confirms the results obtained in former experiments, which showed that the nutrient ratio, while useful enough in comparing single fodders, was of little practical applicability to a mixed fodder whose constituents were of so varied a kind as turnips, hay, and cake.

I have no wish to undervalue the service to agricultural science that has been rendered by the discovery of the "nutrient ratio," but the results of these and the former feeding experiments show that its application to commercial feeding must be confined within narrow limits. The determination of nutrient ratios derived from figures representing the average composition of feeding-stuffs and their average digestibility, and applying these to whole dietaries, including coarse and concentrated fodders, is of no use whatever as a guide in feeding operations, and the custom of calculating these ratios to units in the first place of decimals is altogether illusory.

TABLE X.—GENERAL RESULTS OF MR M'CAIG'S SHEEP-FEEDING EXPERIMENT AT CHALLOCH, 1900.

Lot.		Organic matter consumed in 19 weeks.	Lave weight. Increase.	Increase per head per week.	Carcass.	Skins	Tallow.
		lb.	lb	lb.	lb	lb	lb
1	Turnips alone . . .	208	25	1.31	48.9	13.1	4.5
2	" and maize . . .	284	34.3	1.80	58.3	14.7	5.6
3	" and oats . . .	266	25.6	1.35	53.2	14.1	5.6
4	" and mixed maize and oats . . .	291	38.2	2.01	58.4	15.0	5.3
5	" and dried grains	317	44.3	2.33	62.8	16.6	6.7
6	" and linseed-cake	266	33.8	1.78	58.4	15.0	5.0

TABLE XI.—ANALYSES OF BY-FODDERS USED BY MR HUTCHESON.

	Undecorticated cotton cake	Linseed-cake	Maize (bruised)	Dried grains
Albuminoids . . .	23.41	29.53	11.16	16.63 *
Oil . . .	8.60	9.75	4.78	5.85
Carbohydrates, &c. . .	33.07	35.45	64.37	50.02
Woody fibre . . .	14.25	5.25	2.50	13.40
Moisture . . .	15.60	14.15	15.32	11.00
Ash . . .	5.07	5.87	1.87	3.10
	100.00	100.00	100.00	100.00

TABLE XII.—ANALYSES OF TURNIPS AND HAY.

	Turnips.	Hay.
Moisture	90.00	19.40
Solids	10.00	80.6
	100.00	100.00
Solids contained—		
Albumen	6.56	10.94
Amides	6.56	.65
Oil, &c. . . . .	...	2.80
Carbohydrates, &c.	69.86	51.66
Woody fibre	9.75	26.15
Ash	7.27	7.80
	100.00	100.00

TABLE XIII.—TURNIPS CONSUMED PER HEAD PER WEEK.

Week ending.	Lot 1.	Lot 2.	Lot 3.	Lot 4.	Lot 5.	Lot 6.	Lot 7.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
December 16	92	87	86	81	85	86	86
" 23	102	105	97	96	101	100	100
" 30	99	98	99	102	99	99	99
January 6	99	98	95	94	94	93	93
" 13	108	99	94	95	88	84	82
Average .	100	97	94	93	93	92	92
January 20	106	92	82	81	81	81	81
" 27	106	99	80	80	80	77	78
February 3	97	93	80	74	82	85	85
" 10	68	71	67	69	76	72	72
" 17	97	90	83	68	82	86	89
" 24	100	103	90	70	87	94	91
Average .	96	91	80	74	81	83	83
March 3	109	105	88	78	90	92	85
" 10	126	120	104	82	104	104	95
" 17	115	109	104	79	95	101	101
" 24	118	114	105	80	86	100	100
Average .	117	112	100	80	93	100	95
March 31	122	131	108	80	104	94	...
April 7	135	134	...	75	...	...	...
" 14	127	117	...	66	...	...	...
Average .	128	127	...	71	...	...	...

TABLE XIV.

Constituents of Turnips consumed.

	1.	2.	3.	4.	5.	6.	7.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Albumen . . .	12·07	12·65	11·48	10·32	11·35	11·58	11·43
Amides, &c. . .	12·07	12·65	11·48	10·32	11·35	11·58	11·43
Oil, &c. . . .	1·98	1·98	1·79	1·61	1·77	1·81	1·79
Carbohydrates, &c..	136·91	136·41	123·85	111·23	122·34	124·90	123·23
Fibre	19·85	19·77	17·95	16·12	17·73	18·10	17·86
Ash	14·29	14·23	12·92	11·61	12·76	13·03	12·86
Total dry matter .	198	197	179	161	177	181	178

Constituents of Hay consumed.

Albumen . . .	8·59	6·17	6·63	6·82	5·32	6·58	...
Oil	2·08	1·49	1·60	1·65	1·29	1·60	...
Carbohydrates, &c..	38·31	27·48	29·56	30·40	23·73	29·36	...
Fibre	19·38	13·91	14·96	15·38	12·02	14·85	...
Ash	5·79	4·15	4·47	4·59	3·58	4·43	...
Total dry matter .	74	53	57	58	45	56	...

Constituents of By-fodders consumed.

Albumen . . .	..	18·02	13·31	8·59	12·81	22·74	22·74
Oil . . . . .	...	6·62	5·15	3·68	4·50	7·51	7·51
Carbohydrates, &c..	...	25·48	37·53	49·57	38·51	27·30	27·30
Fibre . . . . .	...	10·97	6·44	1·92	10·32	4·04	4·04
Ash . . . . .	...	3·90	2·67	1·44	2·39	4·52	4·52
Total dry matter .	...	65	65	65	68	66	66

Total Organic Food Constituents consumed.

Albumen . . .	34·0	49·5	43·0	36·0	40·8	52·5	45·6
Oil	4·1	10·1	8·5	6·9	7·6	10·9	9·3
Carbohydrates, &c..	175·0	189·4	191·0	191·0	184·6	181·6	150·5
Fibre	39·2	44·6	39·3	33·4	40·1	37·0	21·9
Total	252·3	293·6	281·8	267·3	273·1	282·0	227·3

TABLE XV.

Digestible Constituents of Turnips.

	1.	2.	3.	4.	5.	6.	7.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Albumen & amides .	15.2	15.2	13.4	12.4	13.6	14.2	13.8
Oil	1.8	1.8	1.7	1.5	1.7	1.7	1.7
Carbohydrates .	123.0	123.0	111.0	100.0	110.0	113.0	111.0
Fibre	17.0	17.0	15.3	13.5	15.0	15.4	15.5
Total organic matter	157.0	157.0	141.4	127.4	140.3	144.3	142.0

Digestible Constituents of Hay.

Albumen	4.0	3.5	3.8	4.0	3.0	3.8	...
Oil, &c.	1.1	.7	.8	.8	.7	.8	..
Carbohydrates .	24.5	17.6	18.9	19.0	15.3	18.8	..
Fibre	11.6	8.4	9.0	9.0	7.2	9.0	...
Total organic matter	42.1	30.2	32.5	32.8	26.2	32.4	...

Digestible Constituents of By-fodders.

Albumen . . . . .	...	13.1	9.6	6.2	9.3	19.5	19.5
Oil . . . . .	...	6.0	4.5	3.1	3.9	6.7	6.7
Carbohydrates .	...	11.7	29.0	46.6	23.9	21.8	21.8
Fibre . . . . .	...	2.5	2.0	1.5	4.0	1.8	1.8
Total organic matter	...	33.3	45.1	57.4	41.1	49.8	49.8

Digestible Constituents of Total Fodder.

Albumen	20.1	31.3	26.8	22.6	25.9	37.5	33.3
Oil	2.9	8.5	7.0	5.4	6.3	9.2	8.4
Carbohydrates .	147.5	152.3	158.9	165.6	149.2	153.6	132.8
Fibre	28.6	27.9	26.3	24.0	26.2	26.2	17.3
Total organic matter	199.1	220.5	219.0	217.6	207.6	226.5	191.8

TABLE XVI.—LOT 1. TURNIPS AND HAY (NO BY-FODDER).

	Dec 9.	Jan. 16.	Feb. 26.	March 24.	1st period, 38 days.	2nd period, 41 days.	3rd period, 26 days.	Total increase.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1 ¹	...	...	...	...	...	...	...	...
2	80	87	99	102	7	12	3	22
3	85.5	90	99	94	4.5	9	-5	8.5
4	75	88	91	100	13	3	9	25
5	71.5	79	82	83	7.5	3	1	11.5
6	88	96	107	114	8	11	7	26
7	79	99	104	97	20	5	-7	18
8	73	91	99	106	18	8	7	33
9	77	89	106	106	12	17	0	29
10	76.5	81	86	95	4.5	5	9	18.5
11	81.5	91	104	106	9.5	13	2	24.5
12	90	96	108	107	6	12	-1	17
13	92	93	96	98	1	3	2	6
14	69	76	87	88	7	11	1	19
15	81	97	109	108	16	12	-1	27
16	81	90	102	113	9	12	11	32
17	84.5	98	110	118	13.5	12	8	33.5
18	82.5	93	102	109	10.5	9	7	26.5
19	82.5	96	101	105	13.5	5	4	22.5
20	77.5	89	98	100	11.5	9	2	22.5
Average	80.4	90.5	99.4	102.5	10.1	9	3	22.1

¹ Went sturdy.

TABLE XVII.—LOT 2. TURNIPS AND HAY AND UNDECORTICATED COTTON-CAKE.

	Dec. 9	Jan. 16	Feb. 26.	March 24.	1st period, 38 days	2nd period, 41 days	3rd period, 26 days	Total increase
	lb	lb	lb.	lb	lb.	lb	lb	lb
1	94	110	124	132	16	14	8	38
2	68	84	90	94	16	6	4	26
3	86	105	119	124	19	14	5	38
4	86	96	119	126	10	23	7	40
5	80.5	103	114	120	22.5	11	6	39.5
6	84	103	121	134	19	18	13	50
7	75	98	108	116	23	10	8	41
8	84.5	102	113	122	17.5	11	9	37.5
9	84	98	110	120	14	12	10	36
10	79.5	78	98	103	-1.5	20	5	23.5
11	75	89	94	115	14	5	21	40
12	71.5	90	110	115	18.5	20	5	43.5
13	87	95	115	116	8	20	1	29
14	65	74	84	89	9	10	5	24
15	74	93	110	114	19	17	4	40
16	80.5	93	110	116	12.5	17	6	35.5
17	86.5	101	118	123	14.5	17	5	36.5
18	92	113	126	130	21	13	4	38
19	93.5	115	123	124	21.5	8	1	30.5
20	74.5	90	104	115	15.5	14	11	40.5
Average	81.0	96.5	110.5	117.4	15.5	14	6.9	36.4

TABLE XVIII.—LOT 3. TURNIPS AND HAY AND MIXTURE OF UNDECORTICATED COTTON-CAKE AND MAIZE.

	Dec. 9.	Jan. 16.	Feb. 26	March 24.	1st period, 58 days.	2nd period, 41 days.	3rd period, 26 days.	Total increase
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	70.5	84	94	102	13.5	10	8	31.5
2	85.5	97	112	123	11.5	15	11	37.5
3	69	84	100	111	15	16	11	42
4	77	93	109	115	16	16	6	38
5	81	102	112	118	21	10	6	37
6	75	94	104	113	19	10	9	38
7	69	86	102	110	17	16	8	41
8	73	86	101	112	13	15	11	39
9 ¹	...	...	...	...	...	...	...	...
10	74	84	96	106	10	12	10	32
11	78	103	111	121	25	8	10	43
12	81.5	98	106	113	16.5	8	7	31.5
13 ¹	...	...	...	...	...	...	...	...
14	74	89	99	106	15	10	7	32
15	84	98	111	122	14	13	11	38
16	84.5	101	118	124	16.5	17	6	39.5
17	73.5	89	107	121	15.5	18	14	47.5
18	97	113	127	140	16	14	13	43
19	77	89	103	115	12	14	12	38
20 ¹	...	...	...	...	..	...	...	...
Average	77.8	93.5	106.5	116	16.7	13	9.5	38.2

¹ Died

TABLE XIX.—LOT 4. TURNIPS AND HAY AND MAIZE.

	Dec 9	Jan. 16.	Feb. 26.	March 24.	1st period, 58 days.	2nd period, 41 days.	3rd period, 26 days	Total increase.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	74	94	108	114	20	14	6	40
2	93	113	124	131	20	11	7	38
3	88.5	110	113	125	21.5	3	12	36.5
4	79	90	96	101	11	6	5	22
5	76	93	98	99	17	5	1	23
6	75	90	96	100	15	6	4	25
7	69.5	88	96	102	18.5	8	6	32.5
8	85	100	121	122	15	21	1	37
9	76	91	99	108	15	8	9	32
10	79	106	122	124	27	16	2	45
11 ¹	...	...	...	...	...	...	...	...
12	82	96	105	121	14	9	16	39
13	95.5	112	123	132	16.5	11	9	36.5
14	70.5	90	104	113	19.5	14	9	42.5
15	82	103	110	122	21	7	12	40
16	77	93	106	117	16	13	11	40
17	74	90	93	108	16	3	15	34
18	80.5	98	108	112	17.5	10	4	31.5
19	79	93	102	111	14	9	9	32
20	76	93	103	111	17	10	8	35
Average	79.5	97	106.6	114.3	17.5	9.6	7.7	34.8

¹ Died

TABLE XX.—LOT 5. TURNIPS AND HAY AND DRIED GRAINS.

	Dec. 1.	Jan. 16.	Feb. 26.	March 24.	1st period, 88 days.	2nd period, 41 days.	3rd period, 26 days.	Total increase.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	80.5	107	111	120	26.5	4	9	39.5
2	82	93	102	115	11	9	18	33
3 ¹	...	...	...	...	...	...	...	...
4	79	90	101	114	11	11	13	35
5	71	94	98	125	23	4	27	54
6	76.5	88	103	111	11.5	15	8	34.5
7	74	95	107	117	21	12	10	43
8 ¹	...	...	...	...	...	...	...	...
9	74.5	93	94	104	18.5	1	10	29.5
10	87	112	123	135	25	11	12	48
11	92	113	124	134	21	11	10	42
12	83.5	108	123	136	24.5	15	13	52.5
13	80.5	104	117	134	23.5	13	17	53.5
14	79	96	102	109	17	6	7	30
15	87.5	98	104	115	10.5	6	11	27.5
16	83.5	112	121	131	28.5	9	10	47.5
17	74	91	98	115	17	7	17	41
18	73	88	100	108	15	12	8	35
19	81	95	99	107	14	4	8	26
20	91	112	117	122	21	5	5	31
Average	80.5	99.3	108	119.5	18.8	8.7	11.5	39

¹ Died.

TABLE XXI.—LOT 6. TURNIPS AND HAY AND LINSEED-CAKE.

	Dec. 9.	Jan. 16	Feb. 26.	March 24	1st period, 88 days	2nd period, 41 days.	3rd period, 26 days.	Total increase
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	78.5	103	113	129	24.5	10	16	50.5
2	84	105	113	129	21	8	16	45
3 ¹	...	...	...	...	...	...	...	...
4	82	94	96	97	12	2	1	15
5 ¹	...	...	...	...	...	...	...	...
6	73	93	101	113	20	8	12	40
7	82.5	97	103	105	14.5	6	2	22.5
8	87	110	128	137	23	18	9	50
9	76.5	102	112	126	25.5	10	14	49.5
10	86.5	99	108	119	12.5	9	11	32.5
11	81	101	113	123	20	12	10	42
12	74	89	97	106	15	8	9	32
13	79	99	109	122	20	10	13	43
14	81	101	107	115	20	6	8	34
15	72	95	109	122	23	14	13	50
16	78	95	103	111	17	8	8	33
17	80.5	99	110	122	18.5	11	12	41.5
18	74	91	97	107	17	6	10	33
19	73	95	109	120	22	14	11	47
20	93	102	109	121	9	7	12	28
Average	79.7	98.3	107.6	118	18.6	9.3	10.4	38.3

¹ Died.

TABLE XXII.—LOT 7. TURNIPS AND LINSEED-CAKE (NO HAY).

	Dec. 9.	Jan. 16.	Feb. 26.	March 24.	1st period, 88 days.	2nd period, 41 days.	3rd period, 26 days.	Total increase.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1	78	95	100	102	17	5	2	24
2	83	105	129	132	22	24	3	49
3	79	98	105	115	19	7	10	36
4	87.5	107	120	130	19.5	13	10	42.5
5	84.5	89	105	111	4.5	16	6	36.5
6	82	105	125.	132	23	20	7	50
7	78.5	92	100	108	13.5	8	8	29.5
8	84	102	113	116	18	11	3	32
9	72	94	105	109	22	11	4	37
10	79.5	95	105	115	15.5	10	10	35.5
11 ¹	...	...	...	...	...	...	...	...
12 ²	...	...	...	...	...	...	...	...
13	79.5	102	114	121	22.5	12	7	41.5
14	83	98	102	112	15	4	10	29
15	82	103	115	120	21	12	5	38
16	77	95	109	115	18	14	6	38
17	77	91	102	110	14	11	8	33
18	71.5	93	108	114	21.5	15	6	42.5
19	82	96	115	125	14	19	10	43
20	93	117	130	139	24	13	9	46
Average	80.7	98.7	111.2	118.1	18	12.5	6.9	37.4

¹ Died.² Took ill.

TABLE XXIII.—WEATHER CONDITIONS AT AIRLEYWIGHT FROM DECEMBER 1899 TO APRIL 1900.

	Average weekly temperatures.		Rain. Inches.	Snow. Inches.	Weekly weather.
	Night.	Day.			
	Min. deg.	Max deg.			
Dec. 16	17	30	.	6	Hard frost all week.
" 23	30	87	.3	2	Frosty to fresh, calm except one day.
" 30	19	84	.6	8	Strong wind on two days.
Jan. 6	32	49	2	..	Bad week, very wet.
" 13	32	42	1.2	.5	Frosty to fresh. Sheep doing better
" 20	31	40	1	1	Very changeable, showery
" 27	34	48	..	..	Fine bright breezy weather.
Feb. 3	23	89	1.2	.5	Fairly good week, hoar frost.
" 10	20	85	..	.7	Strong cold winds Turnips frozen.
" 17	28	97	..	9	Hard frost. Full gale one day, severe weather.
" 24	29	41	2.2	..	Bad week, soft above, hard below.
Mar. 8	38	48	.5	..	Improving, frosty mornings, drying up.
" 10	27	51	..	..	Grand week for sheep. Land dry.
" 17	32	50	..	..	Fairly dry, but stormy and cold.
" 24	30	29	1.1	1	Bleak showery weather.
" 31	27	49	3	2	Fair good week, cold nights.
April 7	30	54	.4	..	Fair good week, warmer.
" 14	34	54	.5	..	Squally weather, mild at night.

BRITISH LIVE STOCK IN THE NINETEENTH CENTURY.

By R. H. REW, London.

THE history of British live stock in the nineteenth century would form, if it were written, not the least interesting chapter in the volume of the nation's annals during that eventful period. The materials for such a history no doubt exist, but they are scattered over a waste of periodical literature, and could only be reduced to coherency by much patient labour and research. The task, too, would need for its adequate discharge some of the higher qualities of the historian's craft, including an ability to discern the working of subtle tendencies and influences, and to review the salient facts with an impartial eye, for the spirit of faction has run high in live stock matters, and the chronicles are by no means free from bias.

The present writer being but a humble student of agricultural history, lays no claim to the qualifications necessary for the discharge of such a task, but when a few months back he undertook, somewhat light-heartedly, to write an article for this volume, it was in the hope that leisure would be available to permit the compilation of something approaching a complete if not an adequate sketch of the progress of the British live stock industry during the past hundred years. That hope has not been fulfilled, and consequently it is only possible to redeem the promise then made by the presentation of a few somewhat disjointed notes, which can claim to be no more than a modest contribution to the subject, the full treatment of which yet remains to be undertaken.

The century has been so strenuous, and its history, on looking back, appears so crowded with incident, that we are naturally led to believe that we have moved very far from the position in which our forefathers stood a hundred years ago. We are apt to lose sight of the fact that activity is not necessarily progress—that the distance we travel is not proportionate to the bustle we make. That there has been progress in stock-breeding cannot be denied, but it is perhaps not quite so great as we are sometimes apt to assume.

So far as the art of breeding is concerned, it is doubtful whether the most skilful breeder of the present day, even with the accumulated experience of the century to aid him, can achieve greater triumphs than did those men of genius who created the Dishley Leicester or developed the modern Short-

horn. In the production of animals of extravagant size and fatness, the breeders and feeders of a hundred years ago surpassed those of the present day. Not to speak of monsters like the "Durham ox," it is the case that the best butchers' beasts were generally bigger, and when ready for slaughter carried more fat than now.

The reduction in size and the slow—too slow—recognition of the inutility of mere obesity have been brought about not so much by initiative skill or design on the part of breeders as in obedience to the insistent demands of the market.

There were two influences at work in the eighteenth century which disappeared during the nineteenth. One was the use of oxen for draught purposes as well as for beef, which naturally tended to maintain size, and the other was the value of tallow. In the days before gas was invented or electric lighting dreamt of, tallow was an important commercial product, as may be gathered from old accounts dealing with the sale and slaughter of beasts.

But there were further reasons a century ago for aiming at size and fatness in the production of beef, because both qualities had then a definite value in the market. Thus George Culley, in his admirable and often-quoted 'Observations on Live Stock,' remarks:¹ "The heaviest and largest oxen of the short-horned breed, when properly fed, victual the East India ships, as they produce the thickest beef, which, by retaining its juices, is the best adapted for such long voyages. Our Royal Navy should also be victualled from these; but by the 'jobs' made by contractors, and other abuses, I am afraid our honest tars are often fed with beef of an inferior quality: however, the coal-ships from Newcastle, Shields, Sunderland, &c., are wholly supplied with the beef of these valuable animals." He adds that these oxen commonly weighed from 60 to 100 stone (14 lb. to the stone), and had several times been fed to 120, 130, and in some cases to upwards of 150 stone for the four quarters only. He gives in detail the weights of four oxen which reached over 150 stone (18½ cwt.) for the carcass, and, including tallow and hide, from 172 to 178 stone.

The "Durham ox," which was exhibited in all parts of the country during the first seven years of the nineteenth century, weighed, when sold as a show animal in February 1801, 27 cwt. The purchaser had a van made for him, and after a tour of five weeks sold him to John Day of Harmston, near Lincoln, for £250. A few months afterwards Day refused £2000 for his bargain, and for six years took his "wonderful ox" through the

¹ Observations on Live Stock. By George Culley, Farmer, Northumberland. Fourth edition, 1807.

country. At ten years old the ox scaled about 34 cwt., but dislocating his hip-bone, he was killed at Oxford in April 1807.¹

Not only was there in those days a demand for "large" meat, but there was also a ready market for meat so grossly fat that a butcher in these degenerate days would blush even to exhibit it in his Christmas display. Culley tells us of a three-year-old wether, his own breeding, which, when killed, was found to have 7½ inches of solid fat on the ribs; and he observes that it was then very common for two-year-old wethers to cut 4 inches thick of fat on the ribs, and from 2 to 3 inches all down the back, while even the ewes produced from 18 to 24 lb. of tallow. He remarks, with his usual discrimination, that "to weak appetites" this is not so inviting as the leaner mutton, but "it finds a ready market amongst the manufacturing and laborious part of the community, whom necessity has taught to lay out their money to the best advantage, and who have found by experience that a pound of beef is not so nutritive as a pound of mutton; and of course they always endeavour to buy that which has the least bone and the most flesh. I am well informed that when the laborious class find this mutton too fat they cut off a part of the fattest, with which they make suet-dumplings, or bread-paste with it for pies, &c., and not unfrequently make sea or boiled pies of the fattest parts." The tastes and requirements of the "laborious class" in regard to meat have obviously changed since then.

One other note as to the taste of the meat-consuming public may be mentioned here. In his account of the Southdown breed of sheep, Culley refers to the fact that they stood higher behind than before, and that their hind-quarters were generally heavier than their fore-quarters. This, he remarks, was in Sussex, where they were bred, esteemed a merit, "as the

¹ The following note, which appeared in the 'Live Stock Journal' of December 7, 1900, is worthy of record for the future historian:—

"I have here a painted print of the Durham ox and John Day standing facing him with stick in hand; underneath is written, 'This wonderful animal is now the property of Mr John Day, of Harmston, Lincoln, and was, March 20th, 1802, six years old.'

<i>Dimensions.</i>				ft.	in.
Height at the shoulder	.	.	.	5	6
Length from the nose to the setting on of the tail	.	.	.	11	0
Girth	.	.	.	11	1
Breadth across the back in three places:—					
Across the hips	.	.	.	3	1
Across the middle of the back	.	.	.	3	1
Across the shoulders squared on each side	.	.	.	3	1
Breadth of the first rib	.	.	.	0	9½
Girth of the foreleg below the knee	.	.	.	0	9½
From the breast to the ground	.	.	.	1	6
Breadth between the forelegs	.	.	.	1	5

" 'This ox is still in a growing and improving state, and weighs, according to the computation of the best judges, 30 score per quarter, which is 300 stone, 8 lb. to the stone.'—J. R. WILLIAMS, Park Hall Home Farm, Oswestry, December 3."

butchers sell the former"—i.e., the hind-quarters—"at full one penny per pound more than the latter, a singularity that, we believe, is peculiar to this district, for in all other markets we have seen, the hind-quarters, and particularly the legs, are sold for a halfpenny a pound less than the fore-quarters." It is easy to appreciate the fact that the butchers and feeders of sheep must have had a somewhat different ideal of form before their eyes when shoulders of mutton were generally more valuable than legs.

Position at the beginning of the Century.

Let us take a hasty survey of the position of British live stock at the beginning of the nineteenth century. Robert Bakewell had been five years dead when the century opened, having been born in 1726 and having died on October 1, 1795. It was about 1760 that he began to be known as an experimentalist in agricultural practice and as a breeder of live stock improved by himself, and it is generally assumed that at that time his father, who died in 1773 at the age of eighty-eight, transferred the entire control of the Dishley Grange farm to him.

Upon the lifework of Robert Bakewell it is not necessary here to dilate. Its influence was both immediate and permanent. Throughout the country his teaching was disseminated mainly in the effective form of object-lessons. Never, perhaps, has the pioneer of a great movement said less and done more. And again, seldom has the work of a discoverer in any branch of technical knowledge been less enduring in form or more permanent in substance. He so moulded that he may be said to have invented the Dishley Leicester breed of sheep and the Longhorn breed of cattle. Yet neither of these breeds can now be said to be widely disseminated, although the principles upon which they were formed have found world-wide acceptance, and endure to this day.

When the century opened the effect of Bakewell's work had already permeated through and fructified in the minds of enlightened stock-owners. Sixteen years previously Charles Colling paid his famous visit to Dishley, and from that event, it may fairly be said, followed the establishment of the Shorthorn breed—now undoubtedly the most widely distributed variety of cattle in the world. It was a few months after that visit that Hubback was bought for 8 guineas, and in the last year of the eighteenth century the first 100 guineas ever given for a Shorthorn cow was paid to Charles Colling. We may therefore, with very slight exaggeration, claim the Shorthorn, as we now know it, as a product of the past century.

The writer of a recent memoir¹ remarks that next to Robert Bakewell, the Collings of Ketton and Barmpton, born a quarter of a century later, are generally regarded as having done the most to improve, and to show how to improve, the cattle of the United Kingdom. This author has had access to family and personal records which throw a searching light on the process by which the Collings arrived at conclusions which have practically been accepted by stock-breeders ever since. That their methods were purely empirical is clear, but it is equally evident that they worked unconsciously in the true scientific spirit. They experimented freely, and with an entire absence of prejudice, guided only by their intuitive judgment of stock. Thus we read that "the two diametrically opposite experiments of in-and-in breeding, and of introducing an alien outcross, were made by Charles Colling practically at the same time. They were experiments in the fullest sense of the word, being bow-shots drawn at a venture without any fixed aim previously determined by theoretical considerations."

As the result of this experiment the Collings became enthusiasts in in-breeding, and were never known to try another alien outcross. This was about three years before the close of the eighteenth century, and may perhaps be fixed as the date of the origin of the pedigree Shorthorn. "Comet," which is described as the crowning triumph of Charles Colling's breeding, was born in 1804.

It may be literally true, as the writer above quoted remarks, that the Collings were not the founders of a new breed of cattle, although the exactitude of this statement depends on the construction that is placed on the word "new." They were, no doubt, "the collectors and preservers of the best remaining specimens of an ancient breed that would otherwise have disappeared," but, although they were of the class who "work better than they know," this does not adequately describe them. The idea of quality, or "handling," was the principle that guided them in their selection, and they also initiated deliberately, and after due trial, the system of in-breeding. In other words, they possessed, in their own particular sphere, the insight, self-confidence, grip, and determination which go far to make up what we term genius.

We have dwelt for a brief space upon the establishment of the Shorthorns, because, unquestionably, that was the salient feature of cattle-breeding a hundred years ago. Other breeds there were, no doubt—the Longhorns, Devons, Sussex, Herefords, Norfolk Polls, Aberdeen and Angus Polls, Galloways, Ayrshires, and Kyloes, but they were more or less confined, and, except

¹ "The Brothers Colling." By Cadwallader J. Bates. 'R.A.S.E. Journal,'

in the case of Longhorns, which had fallen under Bakewell's masterful influence, were mostly unimproved, although here and there individuals, like Francis Quarterly with the Devons, had begun patiently and skilfully to work on systematic and progressive lines.

The position of sheep at the beginning of the century may be succinctly described as the Dishley Leicesters first, the South-downs second, and the rest nowhere. As for pigs, the most numerous breed were the Berkshires, which, according to Culley, were "spread through almost every part of England and some places of Scotland." He describes them as being in general of a reddish colour, with black spots upon them, large ears hanging over their eyes, short-legged, small-boned, and inclined to make fat. He mentions also the Chinese or Black breed as fattening amazingly fast and "affording the sweetest bacon," while the only breed of pigs which he knew of in these islands was the "Highland or Irish" breed.

Number of Stock at different Periods.

A question which has all the interest of being in the nature of things practically unanswerable is the number of live stock which existed in the country when the nineteenth century began. Arthur Young arrived at a total of cattle in England and Wales of $3\frac{1}{2}$ millions, at about the period 1780, and although it could only have been an enlightened guess, there is reason to suppose that it was a rough approximation to the facts. In 1837 M'Culloch estimated the total number of cattle in England and Wales as rather more than 4 millions, and in Great Britain as nearly $5\frac{1}{2}$ millions. When, some thirty years ago, official returns were first collected, the number was found to be about 4 millions in England and Wales and about 5 millions in Great Britain. At the close of the century these figures had increased to over $5\frac{1}{2}$ millions in England and Wales and $6\frac{1}{2}$ millions in Great Britain.

Some very wild shots at the number of sheep were made a hundred years ago, as many as 45 or even 55 millions being suggested.¹ A more careful computation, quoted with approval by M'Culloch, put the total number of sheep and lambs in England and Wales at just over 26 millions in 1800. M'Culloch himself in 1837 considered that this number had not sensibly varied, and adding $3\frac{1}{2}$ millions for Scotland, he arrived at a total of nearly 30 millions for Great Britain. Thirty years ago the number, when officially counted, was found to be about 30 millions, and since then there has been a decrease of over 2

¹ "Statistics of Agricultural Production." By Major Craigie. 'Journal of R.S.S.,' 1883.

millions for the country as a whole. In England and Wales the number was 22 millions thirty years ago, while it has now fallen to $19\frac{1}{4}$ millions.

As regards horses, it appears that in 1814 the number for which duty was paid in England and Wales was nearly $1\frac{1}{2}$ millions. This did not include stage-coach, mail-coach, and hackney-coach horses, or those used in posting. Poor persons keeping only one horse were exempt from duty, as also were horses employed in the army. The number of mail, stage, and hackney-coach horses and of post-chaise horses was estimated at 100,000.

McCulloch in 1837 reckoned that there had then been an increase since the beginning of the century, and that the total number in Great Britain at that date, "employed for various purposes of pleasure and utility," was $1\frac{1}{2}$ millions. The official returns are not comparable with these estimates, as they do not include any horses other than those used solely in agriculture or unbroken. Thirty years ago the number thus enumerated for Great Britain was about $1\frac{1}{4}$ millions, and this has now increased to $1\frac{1}{2}$ millions.

Pedigree-breeding.

The chief characteristic of the nineteenth century has been the extension throughout the rank and file of stock-owners of the principles which had been practically established by a few pioneers at the close of the eighteenth century. The result has undoubtedly been an enormous improvement, and levelling up, of the flocks and herds of the country. In this educational or propagandist work agencies of different kinds have been engaged. The Holkham sheep-shearings were perhaps the earliest agency of this description, and very potent and far-reaching was their influence. Soon after the century began agricultural shows commenced their beneficial career. The Highland and Agricultural Society, the Bath and West of England Society, and one or two others, had been established in the preceding century, and had undoubtedly assisted in the agricultural awakening; but the show system did not begin to exert its full powers until the nineteenth century was well advanced.

The improvement of form and character, which was the primary achievement of the shows, was accompanied by a keener recognition of the principle of early maturity. This principle had been enunciated by Bakewell, but, as already indicated, it was the pressure of altered economic conditions which drove it home to the minds of stock-owners.

If we were to attempt to distinguish the dominant factor in

the progress of British live stock during the past hundred years, we should be disposed to find it in the phrase pedigree-breeding. At first when the waves of improvement spread throughout the country from Dishley, from Ketton, and from Glynde, it was necessary to take "foundation stock" from the best available sources, and while local breeds were, so to speak, in the crucible of amelioration, there was a wise liberality in the use of the most suitable constituent elements.

A very able writer on live stock history, recently deceased, portrays in vivid language the indifference to records which, no doubt, was the mental attitude of stock-owners in the days before pedigree-breeding effected so great a change—i.e., up to nearly the close of the eighteenth century. "So long," he writes,¹ "as each breed remained in comparatively few hands, so long as it was a breed of only local reputation, its producers and admirers were satisfied with local traditions of its sources and development. We do not find that there was any great pressure for the discovery of forgotten evidence upon the antecedents of either breed when Mr Welby, the Linton blacksmith, stepped into the path of Sir Thomas Gresley, whose half-fancy Longhorn was moulded by that son of Vulcan into a genuine 'poor-man's cow'; when the village wheelwright sold his two Hereford cows, the grey and the spotted-faced red, to Mr Benjamin Tomkins of King's Pyon; when Mr Francis Quartly was quietly going about among the Devon farmers, outbidding the butchers for their finest cows; or when the Hurworth stone-mason's cow sought her daily sustenance in the hedge-side of a country lane, followed by her bull-calf, afterwards named Hubback."

In fact, the early show catalogues of the leading societies indicate, by the absence of information as to breeding, the indifference of breeders to the records of the ancestry of their animals. The breeder's name and reputation were regarded as sufficient guarantee. A story is told of a buyer who sent his son to the breeder of a purchased bull with a civil request for his pedigree. "Go and tell your father," was the reply, "that I bred the bull"—a dignified rebuke to unreasonable inquisitiveness.

But just as the Collings soon became devotees of in-breeding, so their disciples speedily adopted pedigree as their guiding star, and in due course realised the virtue of written records. Every breed as it became established tended to become shut up, as it were, within itself, and purity of blood was insisted upon as the first essential. Breeders began to keep their own private records of the breeding of every animal, and this, as numbers increased and interest became more wide, was recognised as inadequate, and public records were started. The earliest book

¹ "Histories of Breeds." By William Housman. 'L.S.J. Almanack,' 1892.

of the kind was the stud-book for thoroughbred horses, the first volume of which was published in 1808. Coates's Short-horn Herd-book was started in 1822, and it was followed by the Hereford Herd-book in 1845 and by the Devon Herd-book in 1851. At a much later period the breeders of sheep began to follow suit, the Shropshire Flock-book, published in 1882, being the first to appear in this country. In the last quarter of the century there has been what may be termed a "rush to records," and the new century finds in existence in Great Britain about forty associations having for their principal object the compilation and publication of a record for a particular breed of horses, cattle, sheep, or pigs.

The Export Trade.

An enormous impetus to the public registration of pedigrees has been given by the growth of the foreign and colonial demand for pure-bred British stock, and the requirement by those distant buyers of a certified guarantee of the purity of the breeding of the animals which they purchase.

In some respects the exportation of live stock from this country is perhaps the most noteworthy and characteristic development of the nineteenth century so far as British agriculture is concerned. When the century began Great Britain was, agriculturally speaking, self-contained. It produced, taking one year with another, sufficient for the consumption of its population, neither more nor less, except in so far as the vicissitudes of season made plenty or dearth. There was only one prominent exception to this general rule—viz., the production of wool, which had for centuries exceeded the home demand. There was also an overplus of hides, so that, on the whole, the British farmer was an exporter to a considerable degree. To quote Mr Thorold Rogers:¹ "The export trade of England was trivial for centuries, except in its two staple articles, wool and hides; in the former of which it possessed an actual monopoly, and was rendered capable of exercising great diplomatic power by virtue of this important produce." So complete was the monopoly possessed by the English sheep-masters that Parliament was able constantly to exact a duty of more than 100 per cent on the sack of ordinary wool without checking the demand, lessening the price, or impoverishing the husbandman. The export duty was, in fact, paid by the foreigner. "So profitable," continues the same author, "was the growth of wool that it was deemed to be a discouragement to general agriculture, and several statutes were passed in the first half of the sixteenth century restraining the

¹ Industrial and Commercial History of England, p. 395.

keeping of excessive numbers of sheep." This, of course, was not the position at the end of the eighteenth century, but nevertheless the exportation of wool was a salient agricultural fact.

The nineteenth century has witnessed an economic revolution, and British farmers now, so far from having any surplus products, fall far short of supplying the home demand. Something like £160,000,000 are paid annually for foreign and colonial farm produce. About 700 million lb. of wool are imported annually, and although in the course of trade some is exported, there is of course a large balance against the flocks of this country. But in spite of all this the position which wool once occupied has been, though of course in a much smaller degree, taken by pedigree stock, and Great Britain is, and for some time past has been, the stud-farm of the world.

When this trade first commenced it is difficult to say precisely. There is reason to believe that the early settlers in New England took with them, or procured, horses and cattle from this country. It is at anyrate stated that as early as 1790 Teeswater (or Shorthorn) cattle, were found, and were in high favour, in Virginia, importations having been made about 1783, when the Collings were beginning their improvements. In the year 1817 there seems to have been a considerable importation of pedigree cattle and sheep to the United States from this country. When Bakewell made his improvements in sheep, considerable numbers of the "Dishley Leicesters" were sent across the Atlantic, and exercised there, as in this country, a potent influence.

The Continental demand for British stock—except for casual consignments—seems not to have begun until the century had run about a third of its course. It was in 1837 that the first lot of Shorthorns was sent to France. In the course of the five following years 108 males and 85 females, of pure Shorthorn blood, were sent across the English Channel, and by 1855 the breed had attained so much importance in France that a Herd-book, analogous to Coates's Herd-book, was established under the control of the French Government.

During the first half of the century the returns of British trade fell far short of their present completeness; but from the year 1853, when the annual statement of trade—in something like its present scope—was first published, it is possible to ascertain readily the number and value of animals exported. Of course these figures must not be taken as referring only to pedigree stock purchased for breeding purposes. In the case of horses the exports comprise a considerable number of riding and driving horses, and of army remounts, while there are also a number of worn-out horses sent across the Channel,

to Belgium and Holland especially, for purposes which are more or less uncertain. The returns of cattle exported include a number which are regularly sent to the Channel Islands for food; while occasionally, as was the case particularly in 1894 and 1895, large consignments of stores are sent to Belgium and France to supply deficiencies in the native herds occasioned by exceptional seasons or other causes.

It would, no doubt, for our immediate purpose, be more satisfactory if we could ascertain the actual numbers of breeding animals sent abroad as distinguished from others; but as this is not possible, we must take the figures as they stand. They seem to show, so far as available, that the trade has increased and is increasing. Without going minutely into statistical detail, the following comparison of the average numbers of horses, cattle, and sheep exported each year in the quinquennial periods 1855-59 and 1894-98 respectively show the growth of the trade:—

	1855-59.		1894-98.	
	No.	Value.	No.	Value.
Horses . .	2677	£150,070	25,664	£667,674
Cattle . .	519	15,647	5,447	120,701
Sheep . .	1783	7,223	8,582	93,763

The first period is chosen merely as that for which the earliest figures are conveniently available; and so far as horses are concerned, the number appears to have been reduced to some extent by the effect of the Crimean war, and the next quinquennium would show about double the number. But after allowing for this the increase is very notable, and it is a fact perhaps not generally appreciated that the export trade in live stock now represents a round million of money per annum.

The average value per head of the animals has altered considerably between the two periods referred to. Thus in 1855-59 horses averaged £56, while in 1894-98 they only reached £26. Cattle in the former period averaged £30 and in the latter £22. Sheep, on the other hand, rose from £4 per head in 1855-59 to £11 in 1894-98.

By the courtesy of Mr E. J. Powell, the secretary of the Shorthorn Society, the following particulars are available for the premier breed of cattle of the actual numbers for which exportation certificates were issued during the years 1882 to 1890 respectively, distinguishing the various countries to which the animals were despatched. This shows a healthy tendency to increase very markedly in the later years, and it also brings out the predominance of the Argentine demand.

STATEMENT SHOWING THE COUNTRIES TO WHICH SHORTHORN CATTLE HAVE BEEN EXPORTED SINCE 1882,
Certificates for their Pedigrees having been issued by the Shorthorn Society of Great Britain and Ireland.

Year.	COUNTRIES.																			TOTAL.		
	Africa.	Australia	Belgium.	Canada.	Denmark.	Finland.	France	Germany.	Holland	India	Jamaica.	Japan.	Madeira.	New Zealand.	Norway.	Russia.	South America.	Spain.	Sweden.		Tasmania.	U.S.A.
1882	...	...	7	...	...	...	46	...	...	...	...	...	...	...	...	...	29	...	...	...	...	...
1883	...	...	10	12	1	...	40	...	...	...	...	...	...	...	...	...	18	...	...	...	...	...
1884	...	...	16	22	...	...	14	24	...	...	1	...	...	...	...	...	142	...	...	...	...	...
1885	...	...	...	3	...	...	12	17	1	...	...	...	...	...	...	...	156	...	...	...	...	...
1886	4	...	...	8	...	...	2	30	...	...	...	...	1	...	...	2	254	...	...	...	...	...
1887	14	...	10	9	...	...	4	26	...	...	...	...	...	...	...	...	375	...	...	...	...	...
1888	5	2	1	2	...	...	14	48	...	...	...	...	...	1	...	...	661	...	3	...	...	...
1889	1	2	2	2	1	...	2	13	...	...	...	...	...	...	...	...	606	...	1	...	...	...
1890	...	7	...	1	...	...	17	25	...	...	...	...	...	...	...	...	207	...	3	...	...	...
1891	...	3	1	1	2	...	10	13	...	...	...	...	...	...	1	1	31	7	59	...	...	...
1892	4	6	1	1	...	...	10	21	...	...	2	...	...	...	...	...	112	1	39	...	...	...
1893	13	...	...	...	...	...	3	15	...	...	...	...	...	...	...	...	218	...	21	...	...	...
1894	20	3	...	...	...	...	2	25	...	...	...	...	...	...	...	...	113	...	...	...	...	...
1895	2	...	...	...	...	...	6	9	...	...	...	...	...	...	...	2	277	...	5	...	...	...
1896	1	1	...	...	...	...	2	15	...	...	...	...	...	...	...	...	667	...	23	...	...	...
1897	2	5	...	1	...	...	2	6	...	...	...	...	...	...	...	1	686	...	5	...	...	...
1898	4	20	...	57	...	1	2	17	...	...	...	...	...	...	...	...	419	...	3	...	...	...
1899	13	...	...	222	...	...	2	15	...	...	...	...	...	...	...	19	626	...	2	...	...	...
1900	4	13	...	490	...	...	2	15	...	...	...	1	...	2	...	26	479	...	...	...	...	...
Total	87	62	48	831	4	1	192	334	1	5	3	1	1	3	1	52	6076	8	164	1	403	8278

Argentine has been recently the chief buyer, but it is encouraging to note that the trade has never been for very long dependent upon one particular market. Thus in 1871 only 5 cattle of any kind were sent to the Argentine, whereas in 1887 the total was 1249, and in 1898, 511. Again, the United States in 1874 took only 15 cattle, and in 1883 no less than 2803, falling again to 18 in 1893 and 14 in 1896, while in 1898 the number rose to 342.

In sheep there have been even more rapid changes. Australia took 1410 in 1873, and two years later not one, though in later years she has been a small buyer. New Zealand buys in some years and not in others, while Canada is also a somewhat fickle customer.

On the whole, it is not unfair to say that the development of the export trade in live stock has not only been a distinctive feature of the nineteenth century, but is also one which affords reasonable hope for further extension in the twentieth. No doubt there is always the bogey that the British breeder is selling to his competitors, and that the animals he sends abroad are used for increasing and improving the meat-supply to this country. That, in any case, is no reason why he should decline the present trade; for if such an argument had prevailed in commercial matters, British manufacturers would have scarcely flourished as they have done. But although, no doubt, a time may come when some of the countries which now purchase breeding animals will become self-supporting and need no further supplies, it is as yet far distant, while other markets will certainly be opened up from time to time. Like the possible exhaustion of coal and other terrors of futurity, we must leave the problem to be faced by posterity under such conditions as may then prevail.

SOLIDS IN COWS' MILK.

BEING A REPORT ON THE DIURNAL VARIATIONS IN THE AMOUNTS OF FAT AND SOLIDS NOT FAT IN COWS' MILK.

By HERBERT INGLE, F.I.C., F.C.S., Lecturer on Agricultural Chemistry, The Yorkshire College, Leeds.

THE variation in the composition of cows' milk has of late attracted considerable attention owing to the unsatisfactory state of the legal aspect of the question in reference to public milk supply.

Many thousands of analyses have been published and many standards have been suggested. The analyses have, for the most part, been made upon samples of the mixed milk of many cows, and on that account, perhaps, are the more likely to give the average composition though not the limits of variation possible in genuine milk.

Abundant evidence as to the mean composition of milk is obtainable: *e.g.*, in the laboratory of the Aylesbury Dairy Company Vieth and Richmond¹ have made more than 200,000 analyses, from which they deduce the average—

	Per cent.
Fat	3.9
Solids not fat	9.0

So also Macdougald,² as the result of the examination of over 12,000 samples during the last three years, gives as a mean—

	Per cent.
Fat	3.82
Solids not fat	8.68

these results being obtained from samples of commercial milk, doubtless including many watered samples.

Kirchner³ gives as the average—

	Per cent.
Fat	3.4
Solids not fat	9.1

So far as the writer is aware, few series of analyses of the milk of individual cows extending over a number of consecutive milkings have been published. Such a series would afford very convincing evidence as to the kind of variation in composition to which genuine milk may be subject, and would show, much more clearly than any analyses of mixed samples, the limits of such variation.

At the suggestion of Professor J. R. Campbell the author undertook the investigation of the diurnal variations in the milk of the herd kept at the East and West Ridings County Councils' Experimental Farm at Garforth, near Leeds, during the Easter vacation.

In this paper, therefore, are given the results of some 700 or 800 analyses of the milks of eighteen cows extending over a period of twenty-one days, each cow's milk being collected and analysed separately morning and evening.

The herd at Garforth consists of nineteen cows of mixed

¹ *Vide* Dairy Chemistry, Droop Richmond, 1899; Vieth, Jour. Royal Agl. Society of Eng., 1899.

² *Vide* abstract in the 'Scottish Farmer,' May 5, 1900.

³ Handbuch der Milchwirtschaft (1886). Older analyses always show lower values for fat and higher ones for solids not fat, owing to defective methods of extraction.

breed, the Shorthorn probably predominating. Their ages vary from three to seven years, their weights from 878 to 1380 lb.

During, and for some weeks previous to, the period of the experiment they each received daily 3 lb. cotton-seed-meal, 3 lb. maize-meal, 3 lb. bran, 2 lb. wheat-meal, chaff and hay *ad lib.*

Of the cows whose milk was examined, eight were considered to be tuberculous, one was doubtful, while the remainder were adjudged free from tuberculosis.

The accompanying table gives further particulars of the cows:—

No of cow	Age	Days since calving to April 1	Weight in lb	Tuberculin test indication	Average milk yield	
					A M	P M
					lb	lb
1	4	40	1204	Free	22	14
2	4	226	1148	Affected	8	5
3	4	244	1218	Doubtful	11	8
4	5	Calved April 2	980	Free	28	17
5	6		1352	Affected	18 5	14
6	6		1196	"	29	18
7	3	88	1008	"	17	12
8	3	83	878	Free	15	10
9	5	30	1354	"	20	15
10	3	Not milking	1354	"	.	.
11	7		1380	Affected	..	.
12	3		992	"	15	8
13	4	221	1322	"	10	6
14	3	157	1092	"	15	10
15	4	154	1196	Free	19	12
16	4	154	1248	"	13	8
17	4	14	986	"	18 5	13
18	4	14	1008	"	25	15
19	4	10	1036	Affected	24	17
Mean yield of whole herd					308	202

The investigation commenced with the evening's milk of March 22, and ended with the morning's milk of April 12, 1900.

The cows were milked at their usual time, about 6 A.M and 3 P.M., thus giving very unequal intervals between the milkings. The milking was performed by men thoroughly accustomed to their work, and the milk record shows that the operation was performed satisfactorily. No question as to the great variation in the amounts of fat being due to partial milking can, I think, be raised.

The milk from each cow, after being weighed, was poured

backwards and forwards from bucket to bucket three times, so as to thoroughly mix it, and a sample was then taken by means of a cup and funnel and transferred to a dry, 10-ounce stoppered bottle, which was duly labelled.

The bottles were packed in an appropriate case and sent twice daily to the laboratory for analysis. As evidence of the care taken in despatching the samples, I may say that only one bottle—that containing the milk given by cow No. 1 on the morning of March 25—was broken in transit.

The fat was determined by means of the Leffman-Beam or the Gerber centrifugal methods, which previous experience and comparison with gravimetric methods have proved to be accurate within 0·1 per cent. In all cases where an apparently abnormal result was obtained the determination was repeated, but in no case was a difference of more than 0·1 per cent observed in any two determinations. In some few instances determinations of the fat by gravimetric processes (ether extractions) were made, and figures concordant with those obtained by the quicker centrifugal methods were obtained invariably.

The specific gravity was determined by the Westphal balance, a method which, in the author's opinion, is decidedly more accurate and in every way preferable to the lactometer or any form of hydrometer. The observed specific gravity was corrected for temperature (to 15·5° C.) by means of the "Richmond" milk-scale.

The total solids were calculated from the specific gravity and the percentage of fat by means of the "Richmond" scale.¹ Several direct determinations of total solids by evaporation showed that the calculated numbers obtained in this way were very accurate.

The following table will show the agreement between the calculated and observed values:—

<i>Total Solids.</i>						
Found .	12·28	11·18	11·56	11·71	12·35	12·82
Calculated .	12·26	11·16	11·64	11·85	12·20	12·76

We may therefore assume without much doubt that the fat and the solids not fat are accurate within 0·1 per cent.

The figures in the tables and diagrams are only given to the first place of decimals, though readings and calculations to the second place were made.

An inspection of the tables and curves will reveal several important facts:—

1. The extreme variability of the composition of the milk of certain cows, especially in the proportion of fat.

¹ Based on the well-known formula— $T = 1·2 F. + ·25 G. + ·14$.

In some cases the amount of fat was often below 2 per cent (*e.g.*, in the milk of Nos. 1, 8, 9, and 18), while maxima of over 5 per cent (Nos. 1, 3, 5, 7, 8, 9, 10, 12, 13, 14, 16, 17, 18, and 19) or 6 per cent (Nos. 3, 10, 16, 17, and 19), and in one case (No. 16) 7 per cent, were observed. In all cases the minima occurred in morning's and the maxima in evening's milk.

Generally speaking, the milk of cows near the end of lactation showed the least variation from day to day, and was, as a rule, of higher quality than that of cows yielding larger amounts of milk (compare the figures for cows 2, 12, and 13 with those for Nos. 1, 6, 8, 9, 17, 18, and 19).

The extreme richness and constancy of composition of the milk of cows "going dry" is well seen from the following analyses of the milk of cow No. 10 milked in the evening only:—

Date.			Percentage of fat.	Percentage solids not fat.
March 22	.	.	5.2	9.9
" 23	.	.	5.2	9.5
" 24	.	.	5.3	9.4
" 25	.	.	6.2	9.8

The extremes in the amount of fat were 1.7 per cent (No. 9, April 6, morning; No. 18, April 10, morning) and 7.0 per cent (No. 16, March 27, evening).

2. The marked difference in quality between morning's and evening's milk. This is well shown in the diagrams. In the case of every cow the morning's milk is poorer in fat than the evening's; this difference is least marked in cows nearing the end of lactation—*e.g.*, cows Nos. 2 and 12.

The differences in the mean composition of mornings' and evenings' milk of the seventeen cows is seen in the following table:—

	Morning.	Evening.	Ratio.
Fat . . .	3.2	4.5	1 : 1.4
Total solids . .	12.4	13.4	1 : 1.08
Solids not fat . .	9.2	8.9	1 : 0.97

The total yields of milk, on the average, at morning and evening are almost exactly in the ratio of 3 : 2, so that the total amounts of fat yielded by each milking would be approximately equal.

The difference in the fat content of morning's and evening's milk is much greater than in most published analyses: *e.g.*, Richmond found during 1896 the average percentages of fat to be 3.63 in morning's and 3.99 in evening's milk; these numbers are in the ratio of 1 : 1.1. Vieth in 1888 found as an average in the milk of ninety-four shorthorns the following: 3.5 per

cent fat in morning's and 4·4 per cent in evening's milk, a ratio of 1 : 1·26.¹

It is well known that the difference is smaller the more nearly equal are the intervals between successive milkings. In this series the intervals were, as already stated, very unequal—about 14 or 15 and 10 or 9 hours respectively.

After the completion of the analyses an attempt was made to determine at what period of the day the maximum production of fat occurred. With this object cows Nos. 5, 6, 9, and 17 were milked at intervals of six hours for four days and a specimen of each cow's milk at each milking was taken for analysis. The following table gives the results of the tests, the numbers for No. 5 being omitted, as the departure from the usual routine so disturbed this cow that she obstinately held back her milk at 11 A.M. and so destroyed the value of the experiment so far as she was concerned:—

	5 A.M.	Time of milking.		
		11 A.M.	5 P.M.	11 P.M.
Percentage of fat in milk (mean) .	2·8	3·6	3·5	3·0
	1b.	1b.	1b.	1b.
Weight of milk secreted (total) .	40	23·5	24	24
" " (ratio) .	1·0	·59	·60	·60
Weight of fat yielded (total) .	1·1	·85	·82	·70
" " (ratio) .	1·0	·77	·75	·64

It appears from these figures that the milk secreted between 5 A.M. and 5 P.M. is much richer in fat than that secreted in the night, and that the largest production of milk takes place between 11 P.M. and 5 A.M.

It has been noticed on the Continent, where cows are milked three times a-day—in the morning, at noon, and in the evening—that the midday milk is the richest in fat.²

3. The comparative uniformity in the proportion of solids not fat. The constancy of this number is well recognised, having been pointed out long ago by Wanklyn. In the series under consideration its extreme variation was from 8·2 to 10·0, but these were exceptional cases—it was generally between 8·4 and 9·5.

As a rule, morning's milk was richer in solids not fat than evening's milk. This is well seen in the diagrams, though the rule is not so generally adhered to as in the case of the fat in milk. In this respect my results are not in agreement with the conclusions of Vieth and Richmond, who assert that, speak-

¹ Jour. Royal Agl. Society of Eng., 1889.

² Van Englen, Jahresbericht über die Fortschritte auf dem Gesamtgebiete der Agrikultur-Chemie, 1899, 480. Gregg and Hendrick, in a paper read before the Public Health Congress at Aberdeen on August 7, 1900, record similar results when cows are milked three times a-day—their averages being 3·5 in the morning, 3·9 at noon, and 3·8 at night.

ing generally, a high proportion of fat is accompanied by a high proportion of solids not fat.

The results confirm the generally received opinion that the amount of solids not fat is the most constant constituent, and therefore serves as the best criterion in judging of the presence or absence of added water. It would not, of course, furnish any indication of the addition of skimmed milk or the removal of cream.

It is to be noted that the diagrams in which the variations in the solids not fat are shown (figs. 69 and 70) are drawn on a scale double that of those showing variations in fat (figs. 66 to 68), so that the actual variability is only half the apparent graphical one.

One feature in these diagrams will be noticed—the invariable depression shown by all the diagrams in the milk of the evening of March 31. In this case the analytical operations were performed on the same evening, within a few hours of milking-time. The author is of opinion, though he has not confirmed it by actual trial, that the abnormally low values are largely due to the specific gravities being determined before the fat globules had solidified; for Richmond has shown that the specific gravity of super-cooled liquid fat is lower than that of solid fat at the same temperature. It has long been known that the specific gravity of freshly-drawn milk increases on standing (“Recknagel’s phenomenon”). It is therefore probable that the amounts of solids not fat given in the diagrams for this date, March 31, are inaccurate and too low. The amount of this rise in specific gravity is generally about .001, which would make a difference of 0.25 per cent in the calculated value of solids not fat.

The maximum and minimum temperatures of the cow-house were recorded during the experiment, but no distinct influence of change of temperature upon the composition of the milk could be traced.

The temperatures are given on fig. 73.

A study of the diagrams will reveal several peculiarities—*e.g.*, as a general rule, whenever the proportion of fat in the milk of any cow is abnormally low in the morning, the evening’s milk is also of a lower quality than usual, while the next morning’s milk is usually very rich in fat.

Summary of Results.

The results of the investigation may be summarised thus:—

1. The proportion of fat in genuine cow’s milk is liable to greater variation than is generally admitted. Samples containing less than 3 or even 2 per cent may often occur, while the

same animals may within a few days yield milk with 5, 6, or even 7 per cent of fat, and this without any resort to "partial milking" or separation of "fore-milk" from "strippings." It is obvious that any standard¹ of 3 or 2.75 per cent of fat would be unfair, if the purveyor of milk is only required by law to sell genuine cow's milk. A milk containing much less fat than this, which would be condemned, according to the modern methods of analysis, as being robbed of fat, might be perfectly genuine. At the same time it must be remembered that the mixed milk of a herd is not likely to show so much variation in fat content. In fact the analysis of a mixed sample yields only an average, and affords no means of detecting the possibility that some of the animals are giving a product very poor in fat, while others are yielding rich milk. (Compare figs. 65 to 68 and 71 and 72 with 73).

2. Milk secreted during the day is richer in fat than that produced in the night. The quantity of milk is, however, smaller. The difference between morning's and evening's milk is mainly in the percentage of fat, the remainder of the solids showing little variation.

3. The comparative constancy in the amount of solids not fat. Cows yielding large quantities of milk tend to give a product lower in solids not fat than those near the end of lactation.

It is also to be noted that the cows were fed during the whole period on rich dry food. Had the food been changed it is probable that still greater variations in the composition of the milk would have been shown.

4. The average composition of all the samples examined is—

	Per cent.
Fat	3.86
Solids not fat	9.06

These numbers agree very closely with those of Vieth and Richmond already quoted.

Tuberculosis and the Tuberculin Test: their Influence upon the Milk yielded by Cows.

As the cows in the herd had all been tested by the tuberculin test, with the result stated on p. 220, it was thought that it

¹ The Society of Public Analysts have adopted 3-per-cent fat, while the Somerset House authorities take 2.75 as standard. In many of the States of America higher values are fixed. If these are stated by law as the standard to which all milk sold to the public must reach, the meaning is clear and precise, but to condemn milk containing less fat as necessarily sophisticated, is obviously unfair. Nor does the "appeal to the cow," often set up as a defence, afford much valuable evidence, since the quality of milk given by any particular cow is subject to enormous variation.

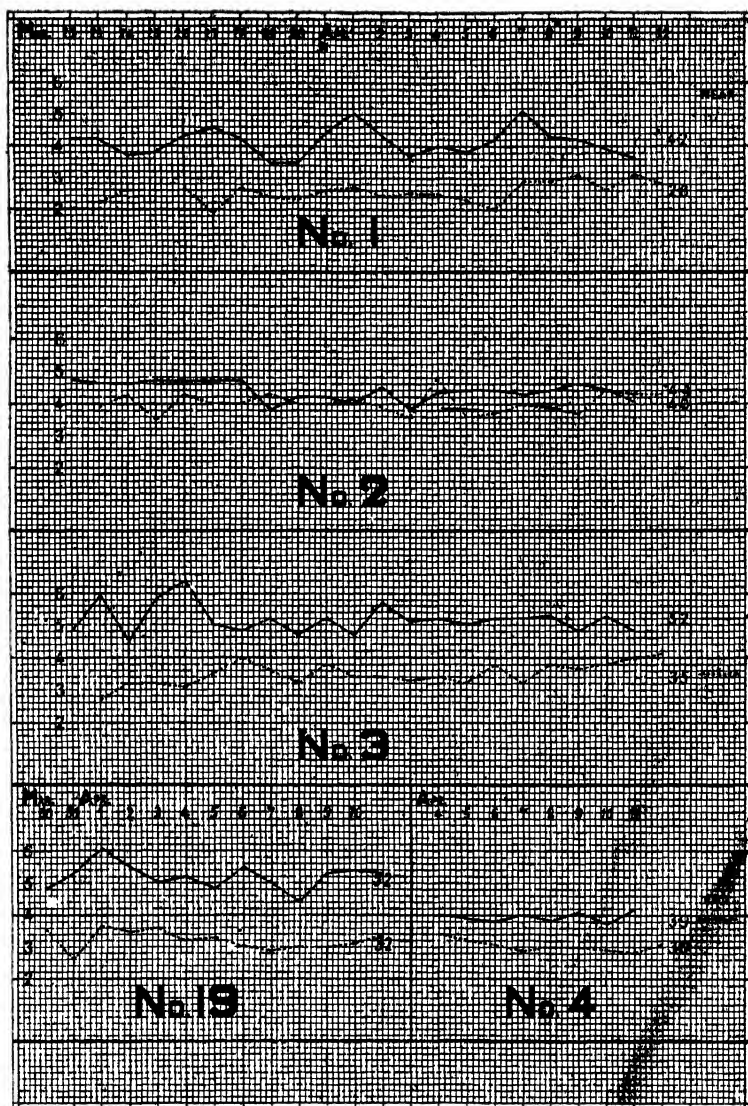


Fig. 65

Figs. 65, 66, 67, and 68 show the variations in the amounts of fat in the milk of each cow. In each case the large figure gives the number of the cow, the dotted line the percentage of fat in morning's milk, the continuous line that in evening's milk of the same day. Each small division represents 0.2 per cent of fat.

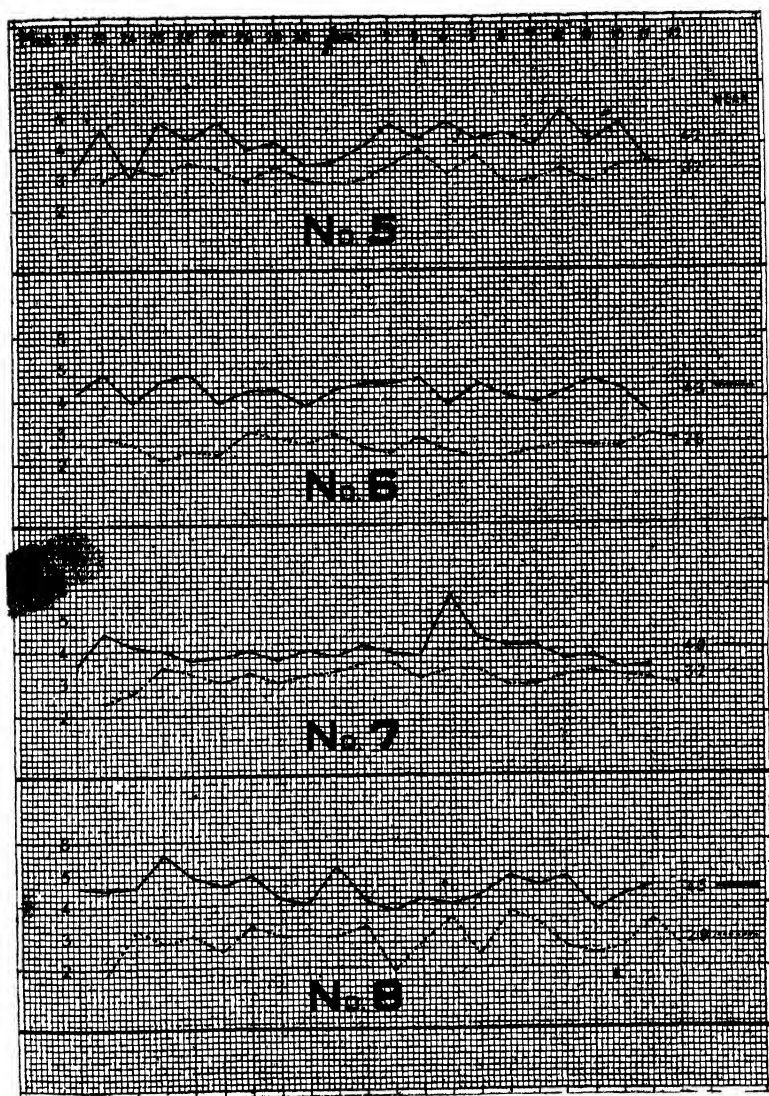
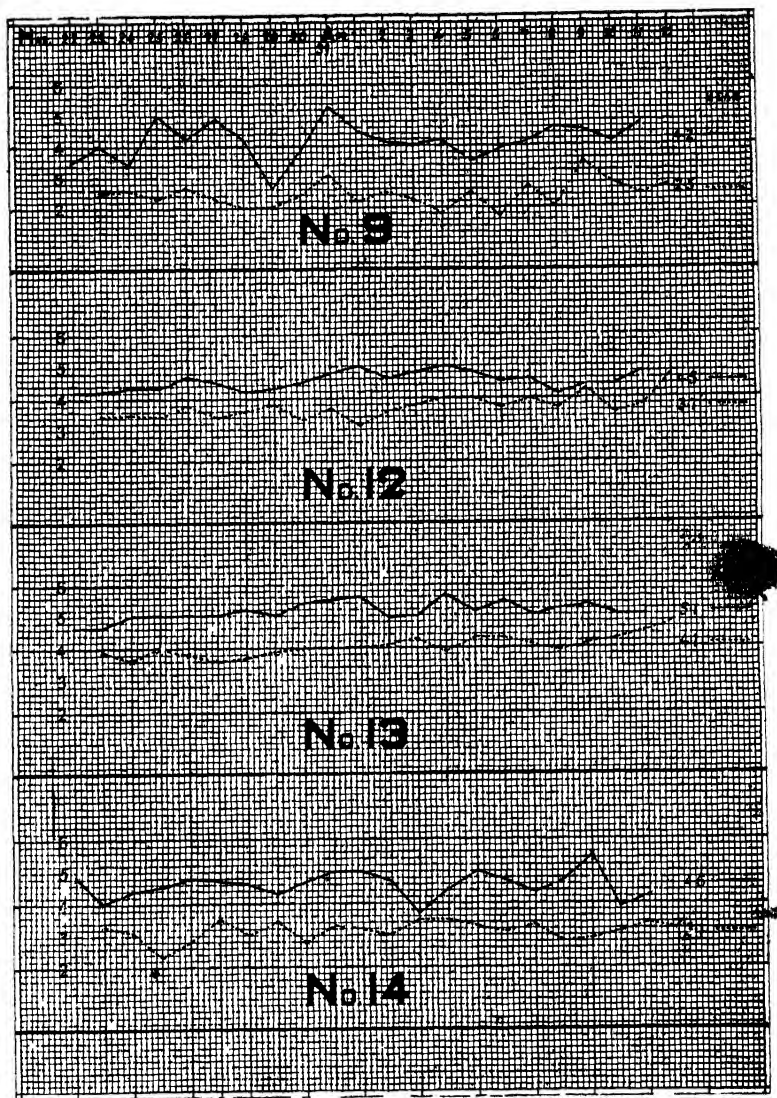


Fig. 66.

Figs. 65, 66, 67, and 68 show the variations in the amounts of fat in the milk of each cow. In each case the large figure gives the number of the cow, the dotted line the percentage of fat in morning's milk, the continuous line that in evening's milk of the same day. Each small division represents 0.2 per cent of fat.



. Fig. 67.

Figs 65, 66, 67, and 68 show the variations in the amounts of fat in the milk of each cow. In each case the large figure gives the number of the cow, the dotted line the percentage of fat in morning's milk, the continuous line that in evening's milk of the same day. Each small division represents 0.2 per cent of fat.

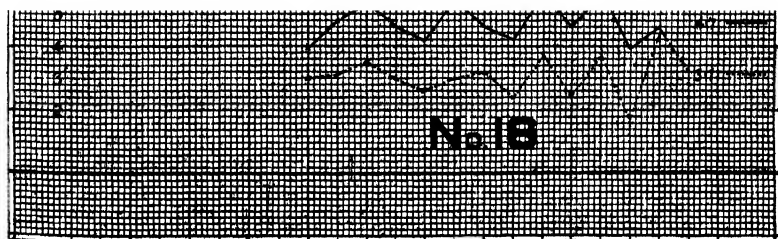


Fig. 68.

Figs. 65, 66, 67, and 68 show the variations in the amounts of fat in the milk of each cow. In each case the large figure gives the number of the cow, the dotted line the percentage of fat in morning's milk, the continuous line that in evening's milk of the same day. Each small division represents 0.2 per cent of fat.

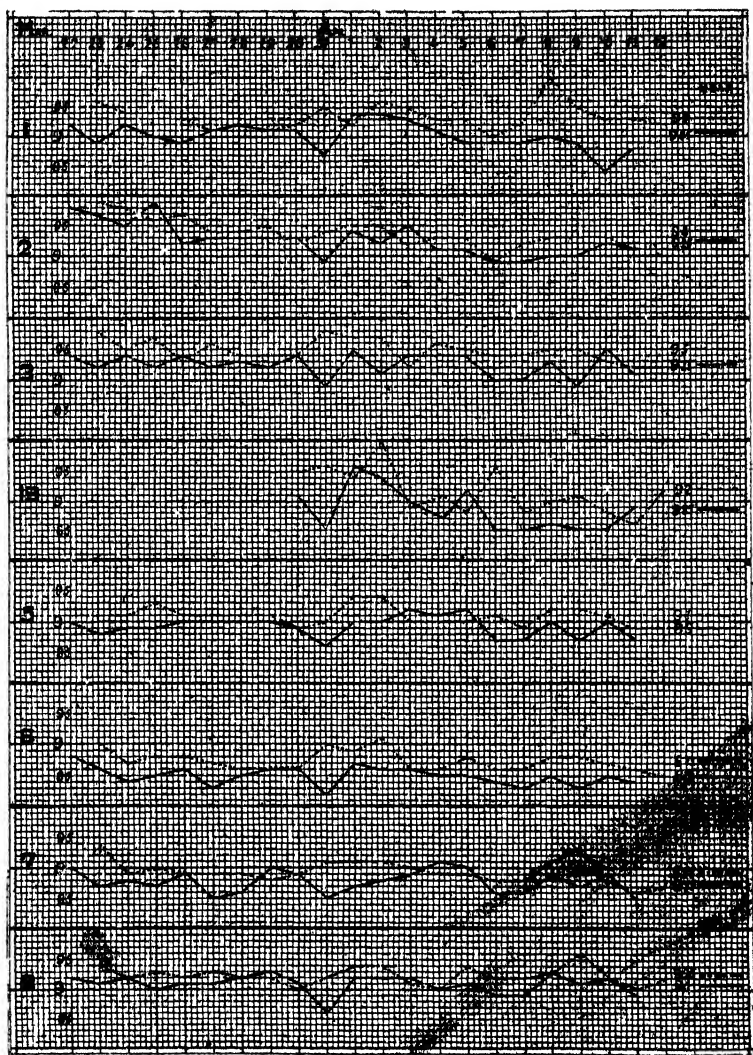


Fig 69

Figs 69 and 70 show the variation in the amounts of solids not fat. The dotted line refers to the morning's milk, the continuous line to the evening's milk. Each small division represents 0.1 per cent of fat.

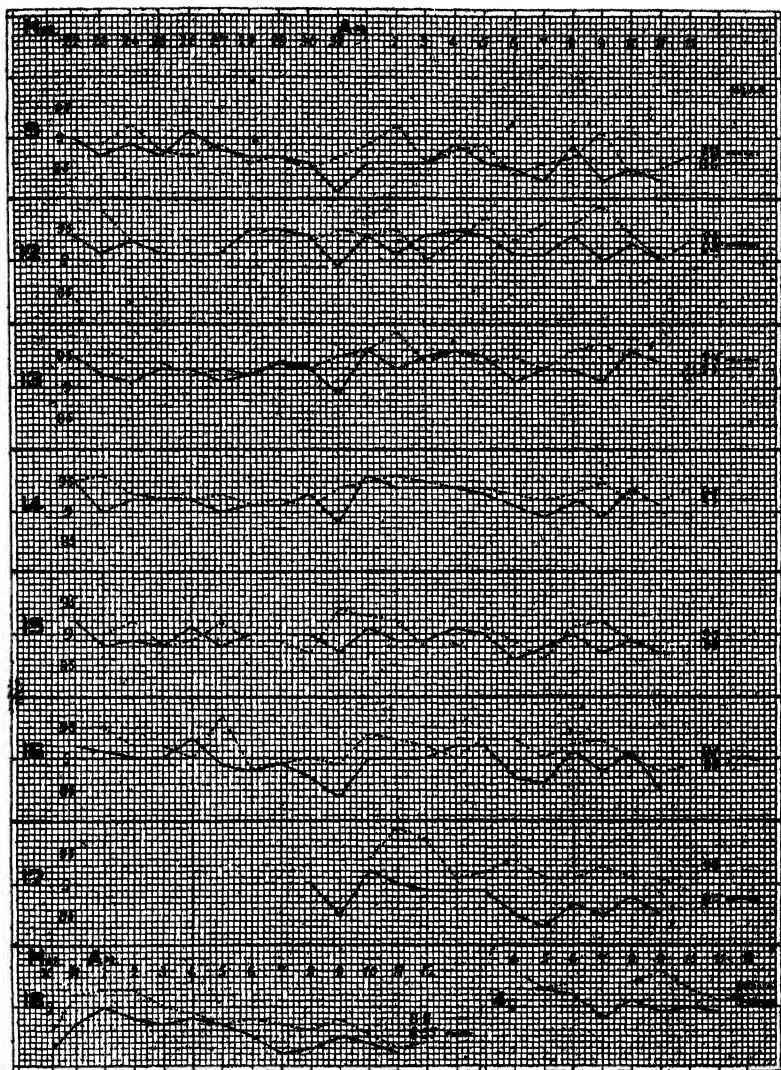


Fig. 70.

Figs. 69 and 70 show the variation in the amounts of solids not fat. The dotted line refers to the morning's milk, the continuous line to the evening's milk. Each small division represents 0.1 per cent of fat.

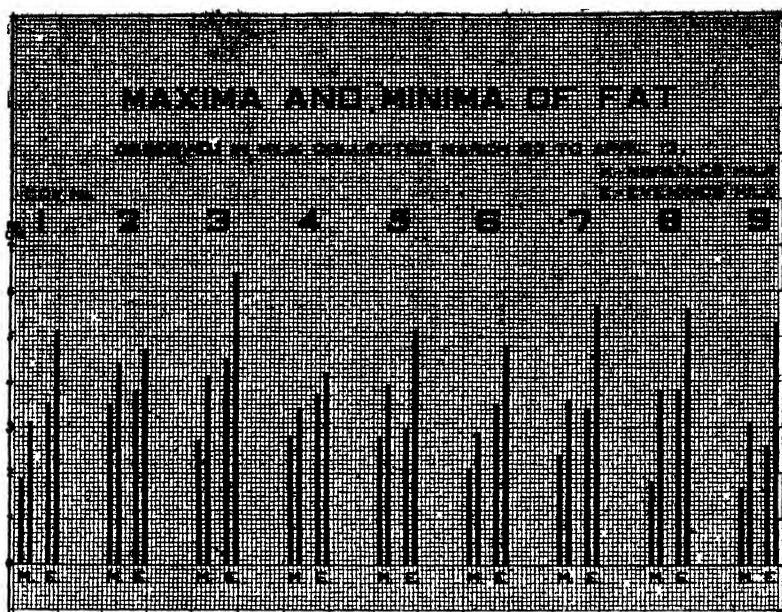


Fig 71

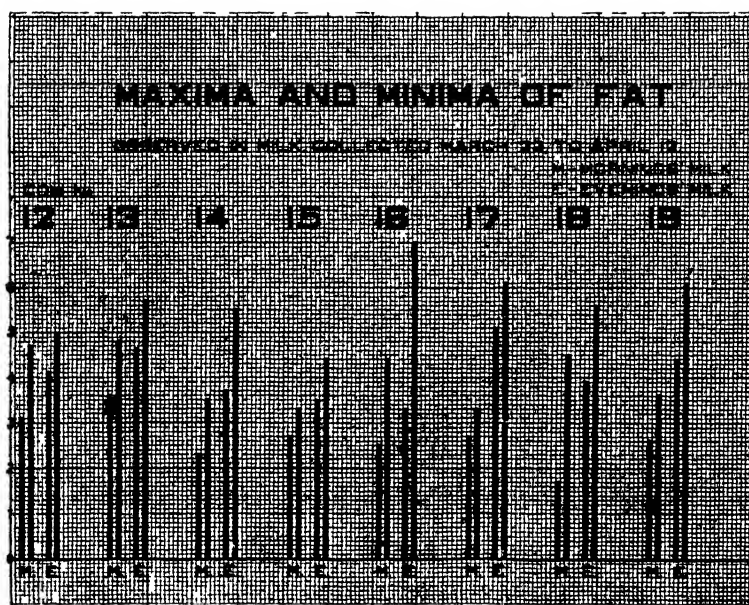


Fig 72

Figs 71 and 72 show the maxima and minima in the amounts of fat observed in the morning (M) and evening (E) milk of each cow during the period of investigation. The heights of the black lines indicate the highest and lowest percentages of fat. Each small division represents 0.1 per cent of fat.

Fig 73

This fig shows the variation in the maximum and minimum temperatures in the cow house, and the daily mean of all the milk samples in percentages of fat and of solids not fat also on the right hand side the limits between which the daily mean percentage of fat was observed to vary

might be possible to trace some influence of tuberculosis upon the milk. Of the 17 animals available for comparison, 8 responded to the test, 8 did not, and 1 was doubtful.

Arranging these 16 cows in two columns with the respective mean fat contents of their milk, we get the following table:—

GROUP A. Free from tuberculosis.			GROUP B. Tuberculous.		
No.	Morning.	Evening.	No.	Morning	Evening.
1	2.6	4.2	2	4.0	4.4
4	3.0	3.9	5	3.2	4.2
8	2.9	4.5	6	2.6	4.3
9	2.5	4.2	7	3.2	4.0
15	3.1	3.9	12	3.7	4.5
16	3.4	4.8	13	4.1	5.1
17	3.0	5.5	14	3.1	4.6
18	3.1	4.7	19	3.2	5.2
Mean	2.95	4.41		3.40	4.54
Mean total yield	160 lb.	104 lb.		136 lb.	90 lb.

From these figures it appears that, contrary to expectations, the milk of the animals affected by tuberculosis is slightly richer in fat and subject to less difference between morning and evening than that from the cows which did not react. The number of animals studied, however, is not sufficiently large to justify much insistence upon these conclusions. Moreover, the cows described as tuberculous were evidently only in the very earliest stages of the disease.

Cows Nos. 17, 18, and 19, which were purchased during the experiment, were at its conclusion tested by Professor Campbell by the tuberculin test, and the opportunity was seized of investigating the influence of this test upon the composition of the milk given by the animals. Accordingly their milk was analysed morning and evening as before for two days before and two days after the administration of the test. The tuberculin was injected on the evening of April 27, and the only cow which showed a rise in temperature was No. 19, whose temperature rose on the morning of the 28th to over 107° Fahr., showing clearly that she was affected with tuberculosis. The milk analysis gave the following results:—

Date.	Fat.		Solids not fat.		Yield of milk in lb	
	Morning	Evening	Morning.	Evening.	Morning	Evening.
No. 17.						
April						
26	2.8	4.1	8.8	8.7	18	13 $\frac{1}{2}$
27	2.7	4.1	9.1	8.9	17	12 $\frac{1}{2}$
28	3.1	4.6	9.2	8.3	16 $\frac{1}{2}$	13
29	3.0	4.7	8.7	9.0	18	9
No. 18.						
26	2.1	4.4	8.8	8.4	21	18
27	2.6	4.3	8.7	8.2	22	17 $\frac{1}{2}$
28	2.9	4.8	8.5	8.2	21 $\frac{1}{2}$	16
29	2.0	5.0	8.4	8.3	20 $\frac{1}{2}$	18 $\frac{1}{2}$
No. 19.						
26	2.3	4.7	8.5	8.5	27	19
27	3.0	4.8	8.8	8.5	27 $\frac{1}{2}$	18 $\frac{1}{2}$
28	1.7	4.0	8.6	8.5	25	14 $\frac{1}{2}$
29	4.4	6.0	8.4	8.6	22	15

A considerable disturbance in both the composition and quantity of the milk of No. 19 was thus evident, while Nos. 17 and 18 were practically unaffected by the test. In the case of No. 19 the milk on the day after the application of the test was much poorer in fat and smaller in quantity than before; on the next day much richer milk was produced than usual, as though the feverish symptoms induced by the tuberculin had postponed for a day the secretion of a portion of the fat.

In carrying out these later investigations the milk was kept for a few days before analysis, and a little "formalin" had been added to each sample as a preservative (in the proportion of about one drop to each ounce of milk). It was noticed, in performing the fat estimation by the Gerber method, that milk to which formalin had been added did not dissolve in the sulphuric acid nearly so readily as pure milk, but formed yellowish curd, which only dissolved after some time with the aid of a water-bath. The addition of formalin to milk samples which are subsequently to be tested by the Gerber method is not, therefore, to be recommended. Samples so treated yield eventually

a perfectly satisfactory result, but considerably more time and trouble are entailed.

In conclusion, I desire to take this opportunity of expressing my thanks to my assistant, Mr J. H. Hinchcliff, for valuable help, particularly in carrying out the specific gravity determinations.

FORESTRY IN THE BRITISH COLONIES.

By WILLIAM BROWN, formerly Professor of Agriculture, Ontario Agricultural College, Guelph, Ontario.

THERE is no rural society that, by right of affinity with old and new membership, spread over the world, can claim so much interest in forestry as the Highland and Agricultural Society of Scotland. This and other good reasons, name it for a short review of the science and practice of forestry as to-day handled in Canada, Australia, and the Cape.

As an historical act for two hundred years, without reference to much art or apparent hope of revenue, it stands oldest at

The Cape.

In 1883 a Cape Forest Department was organised under trained European and Indian officers, and the country divided into four self-responsible conservancies. Each is of course administered by a conservator. Planting—there could hardly be any replanting or even conservation to any extent where forest, and trees even, had been but specks on a great continent of mountain and vale—was entered upon at once, and the present-day report is full of capital irregular material. I say irregular, because there should be but one responsible head in such work,—a report in four similar parts is simply a public nuisance.

The first thing that interests the true forester is of course the detail system of management in every respect, and specially upon what principle the crops are grown and cut down. After fifteen years' local experience one expects to find a settled plan of work and a national increment in several forms. One of the conservators, however, says, "The necessity for working plans is therefore very urgent, and a memorandum on these is appended by the Assistant Conservator of Forests."

The Assistant Conservator reports, "No definite policy has, I think, been fixed for our colonial forests"—naming the four

conservancies of South Africa—"and certainly no definite scheme exists for the Knysna." This is a serious admission after so much experience; but he continues: "There is often a strong feeling held by the surrounding forest population that these forests are their own peculiar property, and that they should be managed to their own immediate interests. This view has occasionally strongly tinged local forest management in years past." So then, undoubtedly, just as the original soil of the Cape should have been held for the original settlers, the Dutch, so the like feeling for the forest and the forester's work still permeates the same heredity.

Then the writer gives some excellent advice how to make up the working plan for the whole interest of the Cape. But, why so late? The Cape has overtaken much planting with very marked success, and distributed many thousands of seeds and plants at cost price—why delay a system of management?

Canada.

Canada, on the other hand, has crept out of a great mass of forest, and is still, as it were, struggling to get rid of too many leaves and roots that, she thinks, retard her agricultural progress. Now and again she has patronised arboriculture—not forestry—out of pure respect for her own heredity, as well as to keep herself in tone internationally, but other than these she has not been a forester in the sense we are advocating. This may appear natural enough to the grower of farm crops under any form of name, nor is it maybe yet an easy matter to convince leaders of rural economy in that great land of fresh lakes and timber area, that any notice is yet needed for systematised forestry on the part of Dominion guidance. The subject is really too wide to be intruded upon the reader now, other than leading up to the teaching at the six experimental stations she supports.

Canadian agriculture has become so bright amongst nations, and timber revenue comes in annually so strong still, that only the prophetic pen may rouse the fattening settlers from their disafforesting lethargy. True, that yet another generation, or even two of them, may feel little touch of awakening over-balanced nature; but it is sure to come, and all we can do at this time is to congratulate upon some work that may be called preparatory in reclothing and conservation.

About the opening of the 'Eighties the Guelph experimental farm, having professionally been teaching the theory of forestry, ventured into some practice in shelter belts and clumps—taking high-lying, exposed, good soil, as well as low-lying, sheltered, and gravelly spots. They had had no experience;

could anything be done—what were the risks? In this mood they ventured into black walnut, European larch, Oregon maple, and other varieties, planting at 7 feet apart, and breaking the surface soil with horse-power several times a season the first five years, for the purpose of retaining moisture and furthering growth.

Within ten years all the clumps specified, and especially the trees named, were able to shelter the largest farm stock. It was almost a revelation to the fellers of forest crops, as it was distinctly a surprise to professional men, to see such valuable timbers shooting into 15 feet in the two exterior directions within the time named: the foreigner, the larch, in a pure gravel pit especially, was a wonder, and spoke of appropriate conditions that at once closed any doubts about the reafforesting of Canada.

Similar tests, on more extensive scales since, have verified this highly valuable fact. In 1891 Ottawa, with her branches Nappan, Brandon, Indian Head, and Agassiz—hundreds of miles apart, and in places where forest trees never before stood—began a series of forest planting that must soon bear important physical and commercial results. At Brandon the prairie is already in two years showing good wind-break beginnings of ash-leaved maple, Russian poplar and willow, and cotton-wood; and at Indian Head the arbor-vitæ, birch, the Oregon maple, and American elm have made a good plant.

In 1893 some ninety species of thousands of native and foreign timbers were planted in shelter-belts at Ottawa. In 1894 Brandon could also speak of having planted as many as 50,000 forest trees in various forms of belts and clumps, and at that time made this memo. on the growth of several during five years.—

	Feet high
Russian poplar	16
Dakota cotton-wood	16
Carolina poplar	15
Sharp-leaved willow	15
Ash-leaved maple	14
Canoe birch	13
Siberian poplar	11
White birch	11
Trembling poplar	10
Balm of Gilead poplar	9
European ash	8
American ash	8
Scotch pine	7
European larch	6
Norway spruce	6

At Indian Head in the same year it was asserted that forest trees can be grown on the most exposed situations. ^{*}Tree-seeds,

however, should be sown in a nursery near the spot for transplanting. Native trees should be chiefly used until they offered protection for foreign varieties. About first week of May is the best time to sow maple, elm, and ash, and is also the best time for transplanting deciduous, and June the most favourable for evergreens. And this station says that everything in forest-tree planting is wasted unless the land is properly broken up and the permanent trees frequently cultivated—using horse-power of course.

In 1895, when Ottawa made her first all-over record, we get the following sizes after an eight-years' growth:—

	Height Feet.	Diameter 1 foot above ground Inches.
European birch	22	10
" larch	18	12
Black cherry	15	8
Scotch pine	12	12
Black walnut	10	8
Austrian pine	10	9
Norway spruce	10	8

And thus up to date at all the stations there have been accurate notes kept of the species and their conduct every season, so that Canada experimentally has done well, and but awaits a system of forestry that would tie the new and the old timber areas into one Dominion system of immense significance and power. Would it not mean—

1. Minimising the fire scourge;
2. Breaking storms;
3. Ameliorating climatic irregularities;
4. Backing agricultural settlement; and
5. Serving the world with timber?

The Dominion may as well now set herself aside not only to emulate the sister colonies, but to lead in such a line of broad-grasping of arboricultural science and practice as should rapidly astonish her own people. Her signal progress in agriculture demands it.

We do not forget to add to the Canadian record the fact of Ontario having established in 1891-93 what may be termed a provincial reminder of Dominion duty; the Department of Agriculture at Toronto has a "clerk of forestry," whose present position is simply one of general teacher. He has issued three or four annual reports of very considerable merit and incentive significance. Of course nothing can be done in the way of national forestry without further powers, and these, as we have hinted, should start from the Dominion, and not by one district only.

South Australia.

The colony of South Australia can fairly claim to be the fore-runner of the most extensive, systematised, and successful forestry in all Australia. One of the Arniston Browns of forest renown was sent out about 1876, and for fourteen years left a mark that is long since world-wide. The work has embraced an expenditure of over £150,000 to date, and already an accruing revenue of £112,000. Some 215,526 acres have been set aside as forest areas, of which 12,000 have already been fenced, planted, thinned, cleared, and replanted partly. Along with this there has been an annual free distribution of nursery plants to the extent of nearly half a million in number; and so, altogether, South Australia is reposing on her well-earned sylvan victories.

The principal species in use have been about nine of the Eucalyptus, Aleppo pine, *Pinus insignis*, *Maritima*, poplars, and others. Here for the first time the sugar-gum acquired its world-wide reputation for rapidity of growth under minimum rainfall, twenty years being abundant in giving all the sizes and soundness for railway sleepers. South Australia, however, must take care of such a reputation in these times of colonial intensesness in all rural economy.

Victoria.

Victoria has no systematised forestry, though it has been under the highest pressure for such a distinction, because of existing material in nature, and of some striking examples of recent cropping, one of which will suffice for illustration.

During the inception of one of the agricultural colleges there in 1889, upon a perfectly treeless stretch of country called the Wimmera, the first thing deemed necessary was shelter. The oldest farmer said that no trees of any sort would grow where none grew in nature, as they had tried it several times; the rainfall of 10 inches a-year and the peculiar character of the soil were against such an idea of shelter; the first railway had even tested the hardy wattle, the Murray pine, and the she-oak of the adjacent country; true that in a few moist and naturally sheltered spots the Californian *Pinus insignis* had prospered, but nothing could be done on such a large scale as proposed by the college management.

The soil is a deep, 20 foot clay loam, of the finest possible texture, without a small stone even to disturb what had produced unaided for fifteen years as much as 40 and 50 bushels of wheat per acre—a rich oily deposit of limy stuff that had no definite geological name. The college management, the year

previous to planting, laid off several belts, clumps, and avenues; ploughed them, harrowed, fenced, and burned the tough tussocks.

Immediately upon the heavy rains of end of March and first half of April they planted seedlings of several native gums, but particularly the *Eucalyptus cornyocalyx*, or sugar-gum of South Australia, several poplars, the pepper-tree of Queensland, and a number of European species, as well as a few acres of the best Tan wattle. As the rains decreased, and every time the heat began to crack the fine soil, or even when too much caking of the surface began to harden up, not to speak of grass and weeds, immediately were the harrows sent over every spot of every tree. This for three or more years in succession, with occasional ploughings, and some, not much, attention to making up vacancies, was all that science and art were asked to do for a distinctly subtropical, arid district, and where nature had declined to make a beginning to clothe herself.

Nine years afterwards the writer examined the results of this work. Many of the sugar-gums were over 30 feet in height and measured fully 2 feet in circumference 6 feet from the ground—sound timber weighing 70 lb. per cubic foot, the lower part of which would easily have produced railway sleepers $9 \times 9 \times 4\frac{1}{2}$. There had been no pruning, no irrigation, nor the need of cultivation during the last four years. Scotch pine and larch had not done well, but poplars and Californian pine were also large, so that with sundry hardy foreigners, the scene in comparison with 1889 was most remarkable and instructive.

Victoria would be wealthy in her timber export were she even to conserve properly—allowing only the natural renewal of her native material.

New South Wales.

Nor has the oldest, the most wealthy in native timbers, and the leading sheep-runs of the world, anything ado with systematic forestry as a department. But it is easy enough to speak of what has about 5,500,000 acres to its name for conservation, and possibly future scientific work. The possibilities are very large and varied, as a recent Premier of the colony not long ago gave evidence by appointing what he called a Director-General of Forests, who essayed such a scheme as no doubt would have tallied with the aim of Colonial Federation, but politics and prospective arboriculture would not consort amongst the leaders.

New South Wales is therefore simmering in the throes of sylvan greatness that may burst at any moment. She possesses as many as *seventy species* and varieties of her own indigenous

timbers, and of course considerable thinning from these annually bring in an irregular revenue.

New Zealand.

Nature, and actual issue, so far without systematic help, have named New Zealand as the true forest zone of Australasia, and yet no professional management marks the interest there.

This is but another example of wealth being trifled with when it has cost man nothing to make it. There are saw-millers, wood merchants, and dealers in wood products — several hundreds in number alone in this colony, which, without any system of supervision, remains waste.

The kauri pine alone has a world to itself in commanding special lines, and high-class commercial timbers number twenty varieties at least; no matter, the people are doing nothing to maintain and inculcate forestry. What a fine chance for another Ednie!

Tasmania.

As in New Zealand, so here also we have a forest island of striking importance but no forestry. When an area of land the size of Scotland can send out annually £35,000 value of gifted stuff in nature, surely, by all the shadows of Sylvanus, the people deserve a long dip in the sea if they do not at once organise a thorough forestry. The stringy bark and Huon pine are alone worthy of capitalising through scientific and practical skill.

Queensland.

Neither can the colony of sugar-cane and big-boned bullocks say anything about forestry other than good wishes for some more success; she does not know, even approximately, how much there is under timber or bush—and there we leave her meantime, in the hope of securing soon a proper recognition of the valuable cedar and kauri, and specially of a soil capable of growing anything they like in forestry.

Western Australia.

This is one of the most recent sproutings into arboriculture. But four years ago it had neither name nor place in the profession—now it leads of all the colonies, Canada excepted, in annual revenue, and 'tis said is also making into the bright arena of conservation, planting, and replanting. May it attain the success of its nearest neighbour,—the management, by the way, is the same, but it possesses different conditions. The climates

are more variable than eastwards, and soils want study; the rainfall is generally plenty when properly handled, nor need the pure sands be avoided in new tree growth. The thing that may douché the whole scheme of progressive forestry is likely to be too much goldfield and too little agriculture. The greed of the one makes economists shy in what they do not understand, and the other yet needs backing up throughout the colony to give the necessary incentive.

But 16,000,000 acres of virgin forest exist in one mass along the south-west coast, where very fair grazing and farming could be extended. When the day comes that this colony can produce and reproduce what nature so bountifully illustrates at present, that will be the day of fat things for it—not excepting all its mineral wealth. There are a dozen dominant forest products—jarrah, karri, wandoo, blackbutt, red gum, York gum, Yate, sandalwood, Jam-wood and wattles,—all already tapped by Government railways and others of private construction, where some fifty extensive sawmills with 2000 men are constantly employed.

Many thousands of the trees of Western Australia are over 150 feet in height, branches up to 100, and 20 feet in circumference 3 feet from the ground, containing 5000 cubic feet of timber each.

Colonial Forestry may be thus characterised.

1. The Cape—an able administrative ability, unsystematised.
2. South Australia—splendid results, now in the lees.
3. New South Wales—a bright beginning, delayed.
4. Western Australia—good work in anticipation.
5. Victoria—the best intentions, needing fruition.
6. New Zealand—physically indifferent.
7. Tasmania—physically indifferent.
8. Queensland—just budding.
9. Canada—independent, but preparing for a beginning.

Present Annual Official Planting in the Colonies.

	Trees.
The Cape	2,000,000
South Australia	100,000
Victoria	50,000
New South Wales	50,000
Canada (estimate)	25,000
Western Australia	10,000
New Zealand	(not given)
Queensland	"
Tasmania	"

Present Annual Export of Timber from the British Colonies.

South Australia . . .	£500	New Zealand . . .	£136,000
Cape Colony . . .	4,500	Western Australia . .	182,000
Queensland . . .	5,000		<hr/>
Victoria . . .	12,000		£420,000
Tasmania . . .	34,000	Canada . . .	5,500,000
New South Wales . .	47,000		

Present Annual Import of Timber to the British Colonies.

New South Wales . .	£350,000	Tasmania . . .	£15,000
Victoria . . .	243,000	Queensland . . .	14,000
Cape Colony . . .	210,000	Canada . . .	...
South Australia . .	205,000		<hr/>
Western Australia . .	142,000		£1,239,000
New Zealand . . .	60,000		

MITES INJURIOUS TO ANIMALS.

THE BIOLOGY OF THE MITES INJURIOUS TO THE DOMESTICATED ANIMALS, WITH NOTES ON TREATMENT.

By R. STEWART MACDOUGALL, M.A., D.Sc., Consulting Entomologist to the Society.

THE class Arachnoidea—embracing Scorpions, Spiders, and Mites—includes within it forms which might seem to have little real relationship to one another. We are concerned here with only one order—namely, the Acarina or Mites.

MITES IN GENERAL.

These generally small animals have a body convex on the upper surface and flattened on the lower surface. The head and thorax are soldered together to form the cephalo-thorax, which rarely shows any signs of segmentation, and is united throughout its width to the abdomen, which typically is unsegmented; the two parts are blended to form a single mass, generally without any sign of the union, but sometimes a slight ridge may be present.

The mouth apparatus is fitted for biting or piercing or sucking, the various united pieces being termed the rostrum. This rostrum is made up of a pair of mandibles or chelicerae which, in types that have them well developed, are didactylous, while, where not well developed, they are somewhat elongated and

altered into simple claws or stylets. Next there is a pair of pedipalps, consisting of a basal part, and a several-jointed palp capable of free movement. The shape of these maxillary palps has been found useful for purposes of determination, and this will be seen in the classification of mites which follows.

There are four pairs of locomotor legs, varying in shape according to the mode of life of the mite, made up of a varying number of joints and ending sometimes in hooks, sometimes in hairs, sometimes in suckers. Newly-hatched forms may have only six legs, the fourth pair not appearing till later. One or two pairs of simple eyes may be present, but often there are none. Breathing may be effected by means of tracheæ or tubes opening to the outside by one or several pairs of stigmata or spiracles which vary in position. In many parasitic forms there are no tracheæ, the breathing being through the skin. The sexes are separate, the females outnumbering the smaller males. Reproduction is generally oviparous; but sometimes live young are produced—these being sometimes 6-footed larvæ, or more rarely individuals possessing all eight legs.

The habit of life varies much in the order. Some mites live in fresh water (*Hydrachnidæ*), some in salt water (*Halacaridæ*); others are terrestrial, living on the sap of plants and causing galls, or feeding off small animals or found amongst decomposing organic matter. A distinct section spends a part or the whole of life as parasites.

Of the ten or so families into which the mites are divided, six claim attention from us, and these may be classified as follows:—

CLASSIFICATION OF MITES.

Body elongated or worm-like. No tracheæ. Legs or epimeræ.	{	Two pairs of 5-jointed legs. Mandibles are stylets. Palps not well developed.	PHYTOPTIDÆ.		
		Four pairs of 3-jointed legs. Mandibles are stylets. Palps have little hooks.	DEMODECIDÆ.		
Body not elongated or worm-like.	{	Legs on distinct epimeræ.	Tracheæ present. Mandibles simple stylets or claw-like. Palps free and armed with little hooks.	TROMBIDIIDÆ.	
			Tracheæ absent. Mandibles didactylous. Palps soldered together for the greater part of their length, and not well developed.	SARCOPTIDÆ.	
		The 6-jointed legs are not on epimeræ, but inserted directly on the body covering.	{	Tracheæ present. Mandibles provided with hooklets. Palps free and thread-like or flattened.	IXODIDÆ.
				Tracheæ present. Mandibles didactylous or simple stylets. Palps free and thread-like.	GAMASIDÆ.

PHYTOPTIDÆ OR GALL-MITES.

For the sake of completeness, and because never a session passes without my getting inquiries about these gall-mites, I notice them briefly, although they are not enemies of stock.

The members of this family are very minute, and are to be recognised under the microscope by their elongated wrinkled body with four legs at the anterior end. By means of the rostrum they pierce the plant-tissue and nourish themselves on plant juices. They cause galls on the leaves of many trees, or a swelling of buds inside which they live; working along with a fungus some may aid in giving rise to those outgrowths on trees known as witches' brooms, so common in our country on the birch.

The member of the family most complained of is *Phytoptus ribis*, whose presence gives rise to the swollen buds on the black currant. Eggs may be found in the buds as early as February, and on through the season all the stages up to the adult may be met with in a dissected bud. Infested buds do not develop either leaf or flower or fruit. Before the buds, which can easily be recognised from healthy normal buds by their greater size, have altogether dried up, and when they are no longer in a condition to provide the necessary food to the mites (say in July), the *Phytoptus* migrates to the small buds that would normally develop in the next year.

The remedial measures are directed to a removal and destruction of the swollen buds (they can be seen swollen in the winter time) containing the mites; to a severe pruning or cutting back, sometimes even to the very ground, followed by a spreading of quicklime on the surface; and to a spraying with paraffin emulsion after the severe pruning or in the spring-time. It must be admitted, however, that in spite of these measures the disease continues to make headway. In cases where attack is limited in extent, such bushes should be rooted out of the ground and burnt, so as to prevent further spread of the *Phytoptus*. Where attack is widespread, nothing will do save the uprooting and destruction of all the plants, black currants not being planted again for some time.

DEMODECIDÆ.

This is a family of very small worm-like mites, with the cephalo-thorax and the transversely striated abdomen distinguishable from each other. The mandibles are like stylets. The adults have four pairs of extremely short 3-jointed legs. There are no eyes and no tracheæ. Sexual distinction is not well marked, but the male is a little smaller, and has the abdomen not so well developed as the female.

From the egg hatches a larva, sometimes legless as in the *Demodex* of the ox, or with three pairs of tubercles (rudimentary legs) and incomplete mouth apparatus. After a moult this 6-footed larva becomes a nymph with four pairs of tubercles. Still another moult results in a second nymph stage, furnished with developed mouth apparatus and jointed legs. The adult stage is attained on development of the sexual organs. The *Demodex* mites live in the sebaceous glands and the hair follicles of mammals.

The numerous forms have been generally regarded as varieties of the one species, *Demodex folliculorum*, but there are several varieties—e.g., those found on man, the dog, the ox, and the goat, which can with fair certainty be distinguished from one another.

The varieties are—

Demodex folliculorum of man (fig. 74).—The mite is common in the sebaceous glands of man's face; a favourite place is the skin of the nose, but the presence of the *Demodex* in man is of no importance.

<i>D. folliculorum</i> ,	var. <i>canis</i> ,	of the dog.
"	" <i>bovis</i> ,	" ox.
"	" <i>ovis</i> ,	" sheep.
"	" <i>suus</i> ,	" pig.
"	" <i>cati</i> ,	" cat.
"	" <i>equi</i> ,	" horse.
"	" <i>capræ</i> ,	" goat.
"	" <i>musculi</i> ,	" mouse.

The mites are very small, the largest being that of man, which measures only 300-380 micros long (a micro = $\frac{1}{250000}$ inch) and 40 to 45 micros broad.

Demodex mange of the dog (*Demodex canis*).—*Demodex* attack is worst on the dog, on which it causes follicular mange. This is a skin affection, characterised by the formation of pustules and by a more or less marked falling out of the hair. The male measures

up to 250 micros long and 45 micros broad; the female is somewhat larger. All the stages—larva, nymph, and mature males and females—may swarm in the sebaceous glands and the hair follicles, the latter particularly, fixed by their rostrum, this being directed towards the base of the follicle.

Attack is chiefly on young dogs, and while all breeds may suffer, the disease is more frequent on dogs with short hair than on long-haired dogs. The disease generally begins about the head, particularly in the neighbourhood of the eyes, and extends little by little to the forelegs, feet, sides, and to the other parts



Fig. 74. — *Demodex folliculorum*. Greatly magnified. (After Lohmann, in 'Das Tierreich'.)

of the body. The symptoms and appearances vary according to the form and the stage of the disease. In its beginnings there are only a very slight itching and small papules, and a redness marking the places where there has been a slight loss of hair; as the disease spreads the skin wrinkles, larger pimples appear, filled with a purulent material, and red crusts mark the place of these when they burst; the itching also may increase. Microscopic examination of the purulent matter squeezed out on to a slide reveals the parasites. A characteristic odour, suggestive of mice, comes off from the patient.

Follicular mange is little contagious, but is not to be despised on this account, as attack is most dangerous, yielding scarcely, if at all, to treatment; and where it has persisted and spread, death almost certainly follows. A good dressing is Peruvian balsam dissolved in alcohol—one part balsam to four of alcohol, the solution to be rubbed daily into the skin after squeezing out the contents of the pustules. Another ointment in use is made of 5 parts creolin and 100 parts lanoline. An experimenter on the Continent claims good results from sulphur baths followed by a rubbing with an ointment made up of—

	Gramms
Naphthol	20
Corrosive sublimate (a dangerous poison)	0.25
Lanoline	100

THE TROMBIDIIDÆ.

There are two distinct sections of this large family, one section vegetable feeders, represented by the red spider (*Tetranychus*) so troublesome to horticulturists; the other section predatory and carnivorous, being free or parasitic on various animals.

Tetranychus, Red Spider.

The name red spider is applied to the varieties of very small mites varying considerably in colour (not merely in the different varieties, but at different stages in the same life-history) and found on the leaves of many different plants—*e.g.*, hop, plum, hollyhock, rose, cucumber, vine.

By means of the mandibles wounds are made in the tissue, and the plant juices are then sucked up by a proboscis. The bristly 8-legged mites spin webs generally all over the under surface of the leaves, the guidance and arrangement of the very delicate silk threads being aided by the characteristic hooks and hairs which terminate the legs. Under cover of the webs the eggs are laid and fixed. From the egg hatches a 6-legged form, which, after a series of moults, attains a fourth pair of legs and

sexual maturity. All the various stages, from the earliest up to the adult, may be met with under cover of a web. The red spiders are social, great numbers being found together. The winter is passed in such shelter-places as cracks in the bark, under leaves, &c. Attack is always worst in conditions of drought and high temperatures. The plants pine away from the drain on them caused by the feeding mites, and from the leaves failing to perform their functions on account of the punctures and from their being covered over with web and debris.

In fighting red spider the watchword should be, "be in time," as, apart from the fact that no man can successfully fight a plague, the washes syringed on the leaves are much more likely to reach the pests before these receive a certain amount of protection from a thick covering of web. The syringing should be repeated, copious, and thorough, care being taken that the under surface of the leaves is reached. Sulphide of potassium (liver of sulphur), in the proportion of $2\frac{1}{2}$ lb. of it to 100 gallons of water, has given good results against red spider on hop. Paraffin emulsion made with soft soap and soft water is always useful, but the strength would require to be graded according to the vigour and nature of the plants.

Trombidium holosericeum,
the Harvest Mite.

This is a pretty, satiny, red mite, with an almost square body, somewhat narrower behind than in front; in the middle of the hind edge there is a small groove. The body and legs are covered with hairs, which, when magnified, show themselves to be of two patterns, those on the upper surface of the body having rounded ends, while those on the ventral surface and on the legs end in a point. Eyes are present on stalks (fig. 75).

From the egg there hatches a 6-legged larva, concerning the identity of which there is a certain amount of uncertainty in the literature. Some believe that the larva is parasitic on one of the long-legged spiders, while others look upon a 6-legged

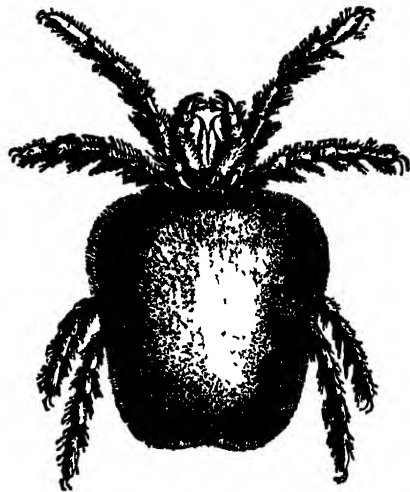


Fig. 75 — *Trombidium holosericeum*, female,
dorsal surface Magnified twenty times.
(After Railliet)

form named *Leptus autumnalis* as the real larva of *Trombidium holosericeum*. The important point for us at present is to recognise in this *Leptus* the enemy whose presence gives rise, it may be, on a number of animals, to a swelling and severe itching.

Leptus autumnalis.

This 6-legged brick-red larva (fig. 76) is just large enough to be seen by the naked eye. The legs are 6-jointed and hairy,

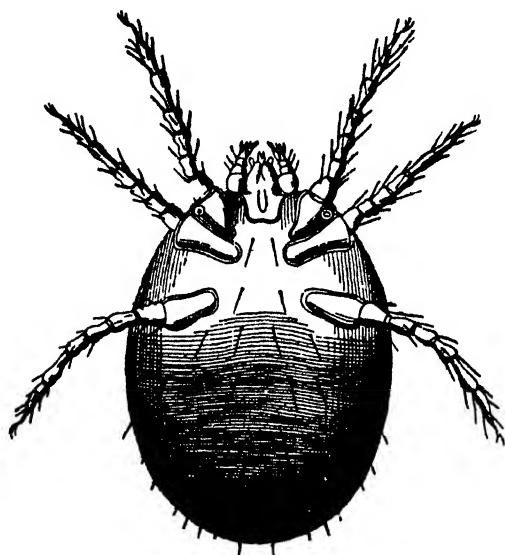


Fig. 76.—Larva of *Trombidium holosericeum*, ventral surface. Magnified one hundred times. (After Railhet.)

and each ends in three slender prongs. There are two small sessile eyes. The palps of the rostrum carry bifid hooks. *Leptus* swarms in late summer and autumn on grass and undergrowth, and on such plants as gooseberry, currants, raspberry, beans, from whence the pest passes on to animals, man—women and children are especially sensitive—the horse, ox, dog, cat, hare, rabbit, mole, and fowls.

The mites attach themselves to various parts of man's body, creeping under his clothing or down his neck, fixing to and burying themselves in the skin, sometimes one here and one there, sometimes a number together. All subjects are not equally sensitive, but smarting, intense itch, reddening and blistering, are accompaniments of attack; sometimes the skin looks as if stung with a nettle. Specimens of the *Leptus* have been sent to me as troublesome to gardeners and other workers in the fields. White, in his 'Natural History of Selborne,' quoted by Murray,¹ says that in the "chalky districts of Hampshire they swarmed to so infinite a degree in the rabbit-warrens on the Downs as to discolour the nets of the warreners and give them a reddish tint, while the men were so bitten as to be cast into fevers."

¹ Economic Entomology. Aptera. By Andrew Murray, F.L.S.

Dogs, especially hunting dogs, often harbour the parasites, fixed about the head and nose and belly and feet, and causing eruptions.

On the cat they give rise to little wounds at the root of the tail and the feet between the claws. Dr Johnston in the 'History of the Berwickshire Naturalists' Club' quotes a correspondent as to this mite on the horse thus, "In the worst case I have ever seen, that on a horse, the skin seemed exactly as if it had been rubbed with a liquid blister."

Fowls and late-hatched chickens are sometimes much annoyed by the *Leptus* mites, which fix themselves at the base of the feathers, where they bury their rostrum. While Railliet writes of this last attack as capable of giving rise to epileptic symptoms, which end in death, the affection on other animals from these mites soon passes off.

Treatment.—A 2-per-cent solution of carbolic acid is a preventive as well as a cure. Rubbing in sulphur ointment or benzine or phenic acid will get rid of the mite. For fowls, dust the feathers with flowers of sulphur.

SARCOPTIDÆ.

This large family comprises in it the mites which cause itch or scab; mites, such as the cheese and sugar mites, and the mites found often in great quantities in hay; mites which infest the feathers of birds, and mites which are found in the air-sacs of birds.

Here we are concerned with the first section.

Mange, Itch, or Scab Mites.

These tiny mites, parasitic upon man and a number of other animals, have rounded or oval bodies with a conical rostrum in front. There is a metamorphosis in the life-history. Except for a few points to be noted later, the round of life of *Sarcoptes scabiei* which follows may be taken as typical of the development and changes characteristic of the Scab Mites.

The fertilised female about to lay her eggs burrows into the epidermis, and makes a gallery along which the eggs are laid one by one; in this gallery may also be found the last moulted skin of the mother, and also excrement. At the end of the gallery the female will be found. The eggs hatch in a few days, and the larvæ on hatching out pierce their way through the roof of the mother gallery into the open, where they live for a short time on the surface of the skin.

These newly-hatched larvæ are 6-legged, and not sexually mature, but otherwise they pretty much resemble the parent. The two front pairs of legs each end in a stalk bearing a sucker.

The two hind legs each end in a long bristle. From the end of the abdomen also there projects two similar bristles. This larva moults several times and grows; it remains quite motionless at time of moulting. It moults itself into the nymph stage, in which stage there are still no sexual organs, but the fourth or hind pair of legs has appeared—each of the fourth pair of legs being terminated by a short and slender bristle. To begin with, the nymph may be found on the surface of the skin, but later it too burrows into the skin or shelters itself below the crust that has been formed as a result of attack.

In the next stage copulation takes place. The male in this stage has its fourth pair of legs terminated by stalk and sucker like the front two pairs, and the sexual organs have been matured. The females, which are somewhat larger than the males, have a rather more oval body, and all four posterior legs terminate in long bristles without suckers. Sexual maturity has also been reached. The males at this time of copulation have reached the end of their development, but the female has still to undergo a last moult, the final form being marked by greater size, greater length of bristles, and a special egg-laying organ. Before the last moult, if a female be examined under the microscope, some fertilised eggs may be seen in the body. To lay these eggs the female pierces the skin.

There are three distinct genera of mange mites—viz., *Sarcoptes*,¹ *Psoroptes*,¹ and *Symbiotes*,² which may be distinguished thus:—

SARCOPTES.	PSOROPTES.	SYMBIOTES.
Body rounded.	Body more oval.	Body more oval.
A short rostrum, with two little expansions outside the palps, termed cheeks.	Rostrum more pointed, and no cheeks.	Rostrum about as wide as long, and blunt; no cheeks.
Legs short, not reaching far from the body. The four front legs spring from the edge of the body, the four hind legs are attached to the under surface of the body, and almost concealed beneath it.	Legs longer, and all four pairs can be seen projecting from the body.	Legs long, and all four pairs visible.
The tarsus or last joint of the leg may bear a long unjointed stalk, terminated in a small sucker or suctional disc.	The tarsus bears a 3-jointed stalk, terminated by a sucker.	The tarsus bears a short unjointed stalk, terminated by a wide sucker.
The mandibles are nipper-like, and the mites, which are not found in colonies, mine into and make galleries below the skin.	The mandibles are more lance-like, and the mites, found many together, do not burrow into the skin, but live in parts sheltered by hair and wool and under crusts.	The mandibles are nipper-like, and the mites which are social live exposed on the outside.

¹ The genus *Psoroptes* is met with in the literature under two other names, *Dermatodectes* (skin-biters) and *Dermatocoptes* (skin-wounders).

² The genus *Symbiotes* is met with in the literature under two other names, *Choriopotes* (hidiers) and *Dermatophagus* (skin-eaters).

The same animal may serve as the host for all the three genera, but each animal has one species of mite which is the most harmful to it. The following table indicates various hosts and the genus of mange mite represented on these :—

HOST.	MAY BE INFESTED BY		
Horse	Sarcoptes.	Psoroptes on the inner sides of legs, tail, mane, genital organs.	Symbiotes, on fetlock and limbs.
Ox.	Sarcoptes ? ¹	Psoroptes on sides of neck and root of tail, extending over body except the limbs.	Symbiotes, at root of tail
Sheep.	Sarcoptes, about the head, and in bad cases to fore limbs.	Psoroptes.	Symbiotes, on the feet and limbs.
Dog.	Sarcoptes.		Symbiotes, affects the ears
Cat.	Sarcoptes.		Symbiotes, affects the ears.
Pig.	Sarcoptes.		
Goat	Sarcoptes, on head and body generally.		Symbiotes, on sides of neck, back, withers, and loins.
Birds.	Sarcoptes.		

¹ There is some doubt as to whether the ox harbours its own variety of *Sarcoptes*. There is no doubt, however, that sarcoptic mange may be present on the ox, although this may be derived from some other animal. Three years ago I had occasion to examine some specimens of mange mites taken from dairy cows near Edinburgh, and the mites proved to be *Sarcoptes*.

Apart from sheep scab, where of the three forms it is the psoroptic which is the most serious and most troublesome form, in all the other animals noted, the noxious scab is the sarcoptic.

Transmissibility.

An important practical point is the transmissibility of mange from one animal to its own or another species, and the results of observation and experimental records in the literature may be summarised thus.

Generally speaking, the Sarcopt in each species of host is very contagious for the same species—*e.g.*, the Sarcopt of the horse is very readily transmissible to another horse.

Man.—The Sarcopt of man experimentally placed on the horse and the dog produced on these an eruption which soon passed off. The same gave no result in the cat.

Horse.—The Sarcopt of the horse passing readily to the ass and the mule, is transmissible to man; but the disease set up on man is not so severe, yielding readily to treatment. It is

believed that the Sarcopt of the horse can affect the ox, but it has not been satisfactorily demonstrated that it can infect other domesticated animals. An experiment on the pig yielded negative results. Psoroptic and symbiotic mange of the horse are not communicable to other animals.

Ox.—Neither the psoroptic nor the symbiotic mange of the ox seems communicable as a permanent disease to the other domesticated animals.

Sheep.—The sarcoptic mange of the sheep passes readily to the goat. Experimentally placed on the horse, ox, and dog, an ephemeral local eruption but no permanent disease was produced. The psoroptic mange of the sheep is not communicable to the other domesticated animals.

Dog.—The Sarcopt of the dog is communicable to man. Placed experimentally on the various domesticated animals the results were insignificant or negative.

Cat.—The sarcoptic mange of the cat can infect man. It can pass also to the horse, the ox, and the dog.

Pig.—The Sarcopt of the pig has been shown to be contagious for man. Experimentally placed on the sheep, cat, and dog, there was no result, or only a slight affection, which soon passed off.

Goat.—The sarcoptic mange of the goat is transmissible to the horse, ox, sheep, pig. There are several Continental records, one an experiment by Railliet, which show that this Sarcopt can be particularly troublesome to man, received either directly or secondarily from one of the aforementioned animals.

Sarcoptes scabiei.

All the varieties of this Sarcopt (fig. 77) do not attack the same part of the body. The young soon attain the adult state, and multiplication is extremely rapid, a single pair, according to Gerlach, in three months being represented through six generations by a progeny numbering one and a half million. Before any structure can be made out the use of the microscope is necessary, and a certain magnification is required even to see the pest. Often, say in the case of the horse, one may, from the symptoms and appearance of the suffering animal, be satisfied that the animal has mange, and yet the itch mite may be difficult to demonstrate. In order to demonstrate the pest one should make a scraping, choosing a recently formed crust. One must go deep enough, for it will be remembered that the Sarcopts burrow below the skin. The scraping should then be placed for some hours in a 20-per-cent solution of potash, at the end of which microscopic examination should easily reveal the parasites. Or remembering that the parasites will be most

active in hot weather or in warm conditions, before taking material for examination allow the animal to remain for some time exposed to the sun or covered with a cloth. The scraping,

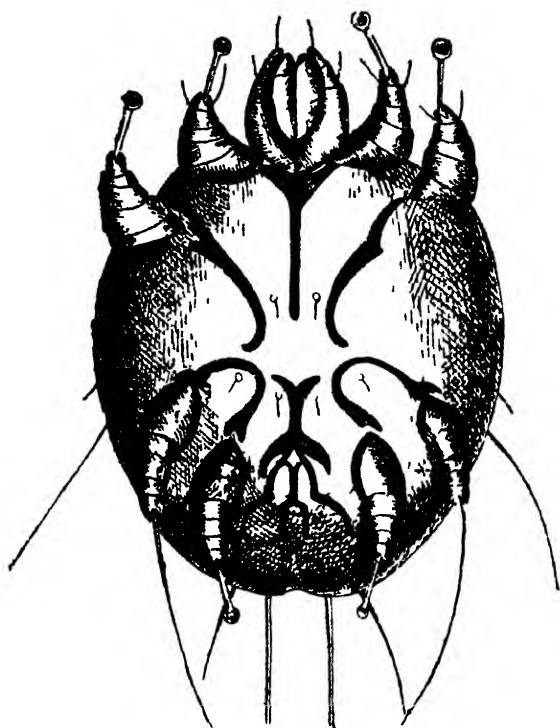


Fig 77.—*Sarcoptes scabiei*. Greatly magnified. (After Lohmann, in 'Das Tierreich.')

when removed to a microscopic slide, should also before examination be gently heated in order to stimulate activity

Sarcoptes scabiei var *equi*.

This mange mite in its attack on the horse generally starts about the withers, the place of attack being marked by a few hard pimples on the skin. As the disease spreads, neck, shoulders, back, and sides may be invaded, long-haired parts (which on the other hand would be chosen by the *Psoroptes* of the horse) being avoided. Characteristic of attack is an intense itching, as evidenced by the horse biting itself and rubbing itself against convenient bodies, this itching being worst at night and in warm conditions, greater in the

stable than when the horse is exposed, and greater when the horse is covered with a cloth than when naked. Pimples form and can be felt as little elevations if the hand be pulled across the skin; these burst from the rubbing and the secretion from them dries into a crust. To begin with, these crusts are isolated, but as the disease spreads different patches run together and a large crust is formed, under cover of which the young mites may be found. The hair also drops out and the skin wrinkles and thickens. Attack is always worst on old, badly-fed, and overworked horses.

Treatment.—The earlier the attack is noticed the easier will it yield to treatment. Care must be exercised against the spread of the disease. The pest spreads easily from horse to horse, especially if the host has been suffering from the disease for some time, in which case contact with a hitherto clean horse for quite a short time is sufficient to ensure infection. The chief agents in the transmission are the larvæ, the nymphs, the newly-fertilised females and the males, these being found more towards the external surface. An attacked horse should be isolated. Common means of infection are the brushes, curry-combs, and instruments used in dressing the horse; while the stall where the patient is housed is a source of danger until disinfected; even in absence of the suffering animal some of the pests are almost certain to be present on the walls or among litter, where they can live in absence of a host for a varying length of time according to the conditions. Gerlach isolated and placed in a watch-glass some *Sarcoptes* of the horse, and found that some of the females lived eight days. Borguignon and Delafond in their experiments found that the parasites allowed to remain on a removed piece of crust and kept in an inhabited stable lived some of them from eight to twelve days, and females fourteen to sixteen days. In another case where the piece of affected skin was kept moist, Gerlach noticed movement of the pests even to the twenty-eighth day.

As practised generally, and as witnessed by myself, the following are the steps taken with regard to the isolated patient: (1) Clip so that the washes may the better reach the pests. Remember that the clipped hair and small pieces of crust falling away may have parasites clinging to them, therefore sweep together and burn. A safe plan would be to spray before sweeping with a 1-per-cent solution of carbolic acid. (2) Soft soap is then applied over the body of the animal, and rubbed in vigorously so as to soften the crusts. After some time slightly warm water is used to form a lather with the soap, and the animal is thoroughly scrubbed. After washing down with water, the body is scraped dry with a straw wisp (to be burnt after use) preparatory to the application of the dressing to kill

the parasite. Of these dressings there are many variations—oils, sulphur, weak solutions of carbolic acid, tobacco, &c. I have seen a sheep-dip used in emergency and with satisfactory results. Gerlach, quoted in Neumann, praises highly creosote—

	Parts.
Creosote	10
Alcohol	10
Water	25

—applied thoroughly twice or three times at intervals of five days.

Neumann also mentions Helmerich's pomade, the formula for which is

	Parts.
Sublimed sulphur	200
Potassium carbonate	100
Lard	800

Hutcheon, mentioning a case of successful treatment in a stud of seventy omnibus horses, thus describes his method: "Each horse, after being cleaned in the ordinary fashion, was dressed from nose to tail and from back to hoofs¹ with horse-oil or melted horse's fat. There was nothing added, only the horse was saturated with it. The following day, before each horse went out, this oil was washed off thoroughly by a mixture consisting of soft soap 1 lb., bicarbonate of potash 1 ounce, and crude carbolic acid 1 ounce. This mixture was made into a creamy emulsion with hot water, and rubbed well on to the skin of the horse all over, thoroughly incorporating it with the oily dressing and then washing the whole off with an abundant supply of clean warm water. The horse was then scraped, rubbed down, and sent out to his work, his harness being cleaned at the same time. Three dressings were repeated in this manner at intervals of three days, after which the stables were lime-washed and disinfected and all utensils treated similarly, and no further trouble was experienced with the disease, although it had been in that stud for over two years previously."

As another example of sarcoptic attack, that on the fowl may be mentioned.

Sarcoptes mutans.

This pest, which lives underneath the epidermal scales of the legs of the fowl, also affects and is contagious for turkeys, pheasants, partridges, paroquets, and small cage-birds like the finches.

¹ Where fatty or oily substances are used as dressings hints are not wanting in the literature of the possible danger of the covering of the whole body at the one moment with the dressing.

There are slight differences in the structure and mode of life of this mite as compared with the general account we gave earlier of the genus. First of all the species seems to be viviparous; then, while the male has the legs provided with the usual stalks and suckers, the legs of the female are usually short and quite lack the bristle and suckers. Again, the female simply burrows into the skin without proceeding to form the little tunnel or gallery described as characteristic for the genus *Sarcoptes*.

The ripe female, broad and smooth and distinctly rounder than the male, is extremely sluggish, scarcely moving if at all, so that the disease is spread by the males, nymphs, and larvæ which do not bury themselves in the skin, but move about more at the outside. The progress of the disease is slow, and is characterised by the following accompaniments: a comparatively slight itching; an elevation of the epidermal scales, chiefly those in front of the tarsus and above the toes; the presence below these scales of a powdery mass glued into a crust by a serous exudate, the whole ultimately forming irregular thick crusts, which, if broken off, leave the skin below exposed and bleeding. On the under surface of these crusts is a number of little pits each such pit having been the abode of an egg-laying female.

The diseased birds are lame, they have a difficulty in perching, and there is a great falling off in their condition.

Treatment.—Separate the mite-attacked birds from the others. Thoroughly cleanse and disinfect the places where the birds have been kept with boiling water and whitewash. As to the affected bird itself, the general plan is to soften the crusts by bathing the leg in hot water and then carefully to remove them. Once the leg is dry it is dressed with either of the following ointments:—

1 part of creosote to 20 parts of lard; or
Helmerich's pomade; or
Balsam of Peru.

The removal of the crusts is often attended with a bleeding, weakening for the fowl, and therefore some prefer to remove only the crusts already somewhat loose and easy to remove, then all is wetted, and the whole attacked area dressed with ointment. After a day or two the dressed limb should be cleansed with soap and water.

Sarcoptes lœvis.

This mite, the cause of the so-called Depluming Scabies, was discovered by Railliet. Depluming Scabies is a very contagious, and a most rapidly spreading disease on pigeons and fowls. Beginning at the rump it spreads to other parts of the body,

the neck and head being sometimes very badly affected. The feathers break off and fall away at the attacked places, and the birds, irritated by the work of the mites, which live at the base of the feathers, pull out their feathers.

Attack is worst in spring and summer. Besides the loss of feathers, the suffering birds become thin and fall away in their egg-laying.

Treatment.—Isolate attacked birds. Wet the base of the feathers with soapy water and then dust the birds with fresh pyrethrum or some other such parasiticide; or rub in an ointment.

Psoroptes communis, var. Ovis, Common Sheep Scab.

This mange mite is larger than the *Sarcoptes* we have been dealing with, and is visible to the naked eye. If we examine with an ordinary hand-lens a gently heated piece of crust from a scabby sheep, containing the parasites, one may follow the mites moving about.

The full-grown male measures one-fiftieth of an inch, and the female one-fortieth of an inch. The adult male (fig. 78) has two abdominal projections which end in long hairs, and on the ventral surface in front of these lobes two copulatory suckers. Of the six front legs of the male each bears a stalk with a sucker. There is no stalk with sucker for either of the two small hind legs. The legs of the female differ in appearance before the last moult and after the last moult. Before the last moult only the front four legs have stalk and

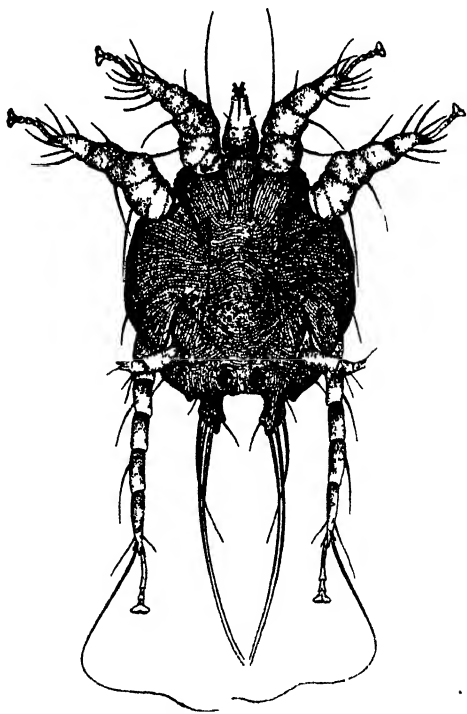


Fig. 78.—Adult male of *Psoroptes communis* from under surface. (After Salomon and Stiles.)

sucker; the hind four legs end in hairs. After the last moult (fig. 79) the stalk and sucker are present on the two front pairs of legs and on the fourth pair, but the third pair of legs remains without stalk or sucker.

This Psoropt is found not burrowing into the skin and laying its eggs in a gallery like the Sarcopt, but living externally on the skin and laying eggs on it or gluing them to the wool near the skin. The parts chosen for infestation are those where the

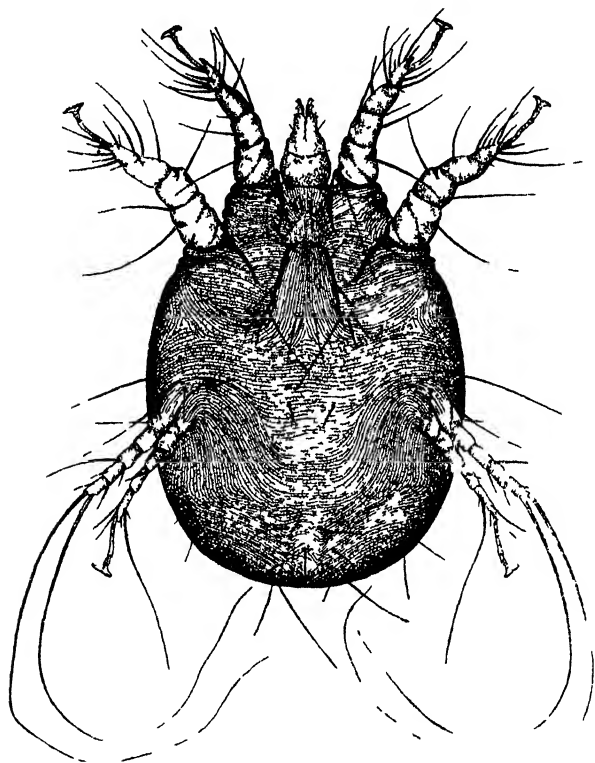


Fig. 79 — *Adult female of Psoroptes communis from under surface*
(After Salmon and Stiles.)

wool is thick—the back, flank, rump, neck. The 6-legged larva hatches from the egg, and the further changes in the round of life from this on to the appearance of fully-developed males and females resemble those we wrote of earlier as characteristic of Sarcoptes.

Symptoms and Result of Attack.—The sheep bite and rub themselves, especially when heated in any way, in order to relieve the intense itching that follows the irritating “pin-pricks” of

the mandibles and the injection into the wounds of some poisonous secretion. Little pimples appear as the result of the woundings, and from them there is an exudation of matter. A number of such merge into one another and the exudate dries into a crust. The sheep in scraping themselves rub off bits of crust which carry with them pulled out pieces of wool. The area of infection goes on increasing as the pests continue their puncturings in the neighbourhood and at the edges of the old thick crusts. It is at the edges of these crusts that desired material can be got for microscopic examination. The possibilities of loss from scab—loss in wool, loss in condition of the attacked sheep, loss by death of the sheep—are well known and need not be dwelt upon.

Treatment.—From the life-history just given, and from all that has preceded in connection with the Sarcoptidæ, it will be readily recognised that great care must be taken to avoid the spread of the disease, by preventing infection to hitherto clean and healthy sheep. Therefore yards and sheds that have contained scabby sheep should be thoroughly cleaned and disinfected and allowed to stand empty for a month before being used again for clean sheep. Any posts in the pasture grounds used for rubbing should be whitewashed, as tags of wool or bits of crust sticking to them may harbour some of the parasites. Hence the danger also to healthy sheep passing along a highway were scabby sheep allowed to make use of the highway.

DIPS, HOW TO MAKE THEM AND WHY USED.

The great method of fighting this Psoropt of the sheep is by dipping. Controversies about dips, like the poor, we have always with us, and because of this, and partly because of the fact that in the last year or two the question of the action of certain dips in spoiling and depreciating the price of the wool has come to the front, I purpose going into some detail concerning various dips, by summarising and annotating the information given about the kinds of dips in an excellent report on these recently issued by the United States Government.¹ This will, I hope, prove interesting and helpful to many members who may not have access to the report.

Starting with an incidental mention of the vexed question of home-made dips *versus* proprietary or patent dips, the report takes the reasonable view that while there have been bad dips of both kinds, or at least dips that failed to do what they were intended to do or advertised to do, yet there are good and satisfactory dips among the home-made as also among the patent.

¹ "Sheep Scab: its Nature and Treatment," by D. E. Salmon, D.V.M., and Ch. Wardell Stiles, Ph.D., Chief and Zoologist of the Bureau of Animal Industry, in the 'Fourteenth Annual Report of the Bureau of Animal Industry,' 1897.

The intelligent attitude of course is, that if the principles underlying dipping and the real purposes sought to be attained by dipping are understood by the farmer, there is no inherent reason why either a home-made dip or a proprietary or patent dip should be a failure if the ingredients in both kinds of dips used be such as are known and approved parasiticides and be present in the proper proportions. In the formulæ for the various dips that follow the reader will observe that there is always present some substance or substances poisonous to the scab parasite, and some water to dissolve or dilute the substances used. There may also be present an ingredient such as potash, whose function it is to soften the scabs so that the poison will the more readily reach the pests; and the formula may contain another substance, added in order that it may combine with the poisonous substance used in order to render the latter more easily soluble—for example, the soda present in an arsenic dip. The chief poisons used are sulphur, arsenic, tobacco, carbolic acid.

Tobacco-and-Sulphur Dip.

This so-called Rutherford or Australian dip has an extremely fine record. The formula is—

Tobacco leaves	.	.	.	.	1 lb.	.
Flowers of sulphur	.	.	.	.	1 "	.
Water	.	.	.	.	5 gallons.	.

How to Prepare.—(1) Infuse the tobacco thus: Place 1 lb. of good leaf or manufactured tobacco for every 5 gallons of dip desired in a covered boiler of cold or lukewarm water, and allow to stand for about twenty-four hours; on the evening before dipping bring the water to near the boiling-point for an instant, then remove the fire and allow the infusion to stand over-night. (2) Thoroughly mix the sulphur (1 lb. for every 5 gallons of dip desired), with the hand, in a bucket of water to the consistency of gruel. (3) When ready to dip, thoroughly strain the tobacco infusion from the leaves by pressing them, mix the liquid with the prepared sulphur and the water to make the required amount of dip.

In this dip we have two substances poisonous to the parasite, tobacco and sulphur; the sulphur also remains for a time in the wool and prevents reinfection. There is nothing in the formula for softening the crusts, hence it is advisable to heat the dip to say 110° Fahr. The sheep should be kept in the dip for a minute and a half. While using, keep the mixture well stirred.

Tobacco.

It is the nicotine in this which poisons the Psoropt. The solution must be extremely dilute or else the sheep are injured—

dogs are specially susceptible. In America—where they are not troubled with tobacco restrictions, and where the farmer may grow his own tobacco—and in South Africa tobacco dips are in high favour. The method of preparation in America is: For every 100 gallons of dip desired take 21 lb. of good prepared tobacco leaves; soak the leaves in cold or lukewarm water for twenty-four hours in a covered pot or kettle, then bring the water to near the boiling-point for a moment, and if in the morning, allow the infusion to draw for an hour—if in the evening, allow it to draw over-night; the liquid is next strained (pressure being used to extract as much nicotine as possible from the wet leaves) and diluted to 100 gallons per 21 lb. of tobacco. The dip should be used as fresh as possible, as it contains a large amount of organic material which will soon decompose.

It is claimed that such a dip does no harm to the wool, but it may cause a “set back” to the sheep. The workers, too, may be sickened, just as one knows how our gardeners may be out of sorts for a time after fumigating plant-houses with tobacco.

In the form in which it is used in Great Britain there are complaints that it causes a permanent discoloration of the wool. Provost Dun of Galashiels, who has taken up this question of wool-discoloration by dips, especially pitch-oil dips, and the general injury to wool from inferior dips, writes to me as follows: “Crude carbolic acid or tobacco-juice used in summer are not so permanent in their discoloration, as the wool is then alive and can throw off the effects; but in spring, when the wool is dying, the recuperative quality is gone.”

Lime-and-Sulphur Dips.

Lime-and-sulphur dips seem not to be used in our country, but from America and Australia and New Zealand there comes a chorus of praise concerning lime and sulphur. There are many variations in the formula given for these, and though the ingredients may be the same, yet if the proportions are different the dip is really a different one; indeed, while lime and sulphur in one set of proportions may be an extremely useful dip, lime and sulphur in another set of proportions may be an extremely bad and harmful dip. Here are various formulæ:—

Flowers of sulphur	.	.	.	20½ lb.
Fresh slaked lime	.	.	.	10½ "
Water	.	.	.	100 gallons. ¹

This is an official Australian dip.

¹ In all the formulæ the gallons are United States gallons, 6 of which are equal to 5 imperial gallons.

Flowers of sulphur	.	.	.	15 lb.
Unslaked lime	.	.	.	15 "
Water	.	.	.	100 gallons.

This is a South African (Cape Town) official dip.

Flowers of sulphur	.	.	.	20½ lb.
Unslaked lime	.	.	.	16½ "
Water	.	.	.	100 gallons.

This is also an official South African dip (February 4, 1897).

Flowers of sulphur	.	.	.	16½ lb.
Lime	.	.	.	33½ "
Water	.	.	.	100 gallons.

This is the Nevada lime-and-sulphur dip.

Flowers of sulphur	.	.	.	33 lb.
Unslaked lime	.	.	.	11 "
Water	.	.	.	100 gallons.

This is the so-called Fort Collins dip.

A mixture used to some extent by the American Department of Agriculture, where the lime and sulphur are in the same proportions, *i.e.*, 1 to 3, as in the Fort Collins dip, but the quantities are reduced—

Flowers of sulphur	.	.	.	24 lb.
Unslaked lime	.	.	.	8 "
Water	.	.	.	100 gallons.

Two dangerous lime-and-sulphur dips—

The California Lime-and-Sulphur Dip.

1. Flowers of sulphur . . . 100 lb.
Lime . . . 25 "
Water . . . 100 gallons.
2. Flowers of sulphur . . . 100 lb.
Lime . . . 150 "
Water . . . 100 gallons.

These last two dips are far too strong, and would harm and might even kill the sheep.

How to prepare the mixture:—

1. Take 8 to 11 lb. of unslaked lime, place it in a mortar-box or kettle or pail, and add enough water to slake the lime and form a lime paste.

2. Sift into this lime paste three times as many pounds of flowers of sulphur as used of lime, and stir the mixture well. Be sure to weigh both the lime and the sulphur. Do not trust to measuring them in a bucket or to guessing at the weight.

3. Place the sulphur-lime paste in a kettle or boiler with about 25 to 30 gallons of boiling water, and boil the mixture for two hours at least, stirring the liquid and sediment. The boiling should be continued until the sulphur disappears or almost disappears from the surface: the solution then is of a chocolate or liver colour. The longer the solution boils the more the sulphur is dissolved and the less caustic the dip becomes.

4. Pour the mixture and sediment into a tub or barrel placed near the dipping-vat, and provided with a bung-hole 4 inches from the bottom. Allow ample time, two or three hours if necessary, to settle. This allowing the sediment to settle is of great importance, and this is why it is better to draw off the liquid in the way suggested (through a spigot) than merely ladling it out, as in the latter way there is more commotion and the liquid does not remain so free from sediment.

5. When fully settled draw off the clear liquid into the dipping-vat and add enough water to make 100 gallons. The sediment in the barrel may then be mixed with water and used as a disinfectant, *but under no circumstances should it be used for dipping purposes*. In some tests carried out by the United States Department of Agriculture it was found that a dip with sediment produced very serious effects, even when no appreciable effects were noticed on samples dipped in the corresponding clear liquid.

Hints as to Lime-and-Sulphur Dips.

1. Do not use a lime-and-sulphur dip in flocks not known to have scab—*i.e.*, as a preventive measure—especially if the flocks are well fleeced.

2. In cases of fresh attack Formula No. 6 would do.

3. Where the scab is very hard use a stronger dip—*e.g.*, the Fort Collins dip.

4. In unusually severe cases use a dip with more lime in proportion to the sulphur—*e.g.*, the Victorian dip, or Nevada, or South African, No. 3.

In dealing with the prejudice, more or less marked, against lime-and-sulphur dips, the authors of the report examine in detail the charges brought against the dips, and summarise thus: If properly made and properly used the lime-and-sulphur dips are second to none and equalled by few. There is always some injury to the wool from these dips, but if made properly and used properly upon shorn sheep the injury is so slight as not to be worthy of consideration. On long wool the injury is greater, and seems to differ with different wools, being greater

on a fine than a coarse wool. Improperly made and improperly used the lime-and-sulphur dips are both injurious and dangerous.

Arsenical Dips.

Many dips, home-made and patent, have arsenic as their basis; but the authors of the United States report do not favour arsenic—not because it cannot make an effective dip, but because they see no reason for running a risk with poisonous arsenic when there are efficient non-poisonous dips. Two formulæ are quoted: *First*, Finlay Dun's—3 lb. each of arsenic, soda ash (impure sodium carbonate) or pearl ash (impure potassium carbonate), soft soap, and sulphur. A pint or two of naphtha to be added if desired. Dissolve the ingredients in 10 to 20 gallons of boiling water, and add cold water to bring the whole up to 120 gallons. The sheep's head must be kept out of the bath.

The other is:—

Commercially pure arsenite of soda	14 lb.
Ground roll sulphur	34½ "
Water	432 gallons.

Mix the arsenite and the sulphur, and then add the water.

Arsenic being so poisonous, certain precautions must be taken, such as clearing yards into which newly-dipped sheep are to be turned of all green food and hay; dipped sheep not to be allowed to return to their grazings till dry, so that there will be no dripping. Do not overcrowd, and dry rapidly. Clean out the dipping yard and pour any dip left over down a drain where there will be no risk of contamination of food, &c. Let dipped sheep remain in an exposed place.

Carbolic Dips.

The report contents itself with mentioning the advantages and disadvantages of "carbolic dips"; and without expressing a strong opinion either way, intimates the hope of carrying out some experiments. The advantage of carbolic is that it kills the mange mites more quickly and readily than tobacco or lime-and-sulphur. The disadvantages are the possibility of the sheep receiving a greater shock and set back from being dipped in a carbolic dip as compared with other dips, as also the fact that the wash passing off readily does not give the sheep much if any protection against reinfection. To remedy this, where such a dip is used, it is recommended that 1 lb. of flowers of sulphur be added for every 6 gallons of carbolic.

In Great Britain, as Professor Wallace points out in his

paper on "Scab" in last year's 'Transactions,' cresylic acid, an allied substance, is in favour rather than crude carbolic acid; but the warning is given that it ought to have a purity of 95 per cent to 97 per cent. Of a lower percentage purity there is a danger of staining the wool. I have already quoted Provost Dun regarding crude carbolic in inferior dips in Great Britain; elsewhere in his letter the Provost says, "Most of the carbolic dips are carefully prepared, and are justly held in high esteem."

The greatest complaints as to harm to wool circle round pitch oil, an ingredient of many cheap dips. There is no reference to this as an ingredient of dips in the United States report, but in our own country it seems beyond dispute that a permanent staining of the wool may be justly ascribed to the presence of pitch oil in the dip.

As the various dips used cannot be relied on to kill the eggs, a second dipping should follow the first at an interval of six to ten days, so that the young from eggs that were not killed at the first dipping may be killed. The second dipping must take place before a long enough time has elapsed to have allowed these young to pair and lay eggs in their turn.

OTHER SARCOPTIDÆ.

There are two other sections of Sarcoptidæ—using this term in its widest sense—that may only be named. These are the Cytodinæ and the Analgesinæ. Both contain mites found on birds.

Of the Cytodinæ *Cytodites nudus* is found all through the respiratory system of Gallinaceous birds. It will be remembered that included in the respiratory apparatus of a bird there are not only trachea and bronchi, but also air sacs and spaces in bones which are in relation to these. In all these places the mite may be found, but in normal numbers seems to cause no inconvenience, although excessive numbers would set up irritation.

The Analgesinæ live in the feathers of birds, between the barbules and among the quills of the larger feathers of wing and tail. They seem to live with the host as messmates, doing no harm.

IXODIDÆ OR TICKS.

This family name, used in its widest sense, embraces two sub-families, the Ixodinæ and the Argasinæ, differing chiefly in the form of rostrum. We are concerned here only with the Ixodinæ.

These Ixodinæ are mites with a terminal rostrum made up as

in the preceding forms of mandibles and maxillæ, but modified in a different way. Parts of the two maxillæ are soldered together to form a so-called dart furnished with backwardly directed hooks. The other parts of the maxillæ—viz., the maxillary palps—are 4-jointed, and generally grooved on their insides. The two mandibles go to complete the rostrum; each has a basal stem and a branched hooked upper part. It is by means of this rostrum that ticks fix themselves so firmly to their hosts. In burying the rostrum in the skin the skin is first of all pierced with the end hooks of the mandibles, and then the central dart is introduced and buried. The maxillary palps do not penetrate the skin, but meet at its surface beside the wound. It is these recurved hooks of the rostrum which make it so difficult or impossible for a man to pull by main force a tick from its attachment. In pulling, the body comes away and the mouth parts are left in the wound, where they—as in a case I witnessed some time ago on a man's leg—by their presence and the rubbing which follows the itching, may cause an irritation that can last and be very disagreeable for some time. Should one wish to relieve himself from an attached tick, a gentle side to side movement may end in the complete withdrawal; but far better is the plan I have seen successfully practised by a person who, while out shooting, received ticks on his arms from the undergrowth in the forest—viz., to bathe the surface with oil, when the ticks will soon let go spontaneously.

Eyes are present in some members of the sub-family and absent in others. The legs end in two claws and a little sucker. The skin is leathery but extensible, and a protective or strengthening dorsal shield is present, grooved it may be, to receive the base of the rostrum. Breathing is by tracheæ, the spiracles opening at the bases of the hind pair of legs. The two sexes differ in size, the male being smaller, and also in the character of the dorsal shield, which in the male may cover the greater part of the upper surface of the body, but in the adult female is limited to a small region at the front part of the cephalo-thorax. The genital openings are median and anterior on the under surface, at a slight distance from the base of the rostrum.

Life-history.

In the life-history there is a metamorphosis, there being four stages—adult, egg, larva, nymph. The larva, when it hatches from the egg, applies itself to reaching a host. There are statements that in some ticks the larva, once having fixed, never leaves go again until maturity has been reached; that the moults characteristic of the different stages take place with the

tick attached to the host. It is certain, however, that in many species—*e.g.*, our own sheep tick—the tick leaves the host in order to accomplish its moults, and then again seeks a host. We shall follow out the changes in such a case.

A fertilised female gorged with blood drops away from the animal that has acted as host for the parasite, and in some sort of shelter, say hidden in the grass, proceeds to lay the eggs.

Eggs and Egg-laying.—These eggs are very numerous, such numbers being given in the literature as over two thousand from the sheep tick (*Ixodes reduvius*) and up to twenty thousand in the South African bont tick. It is towards the production of these huge quantities of eggs that the female gorges herself with blood. The method of ovipositing is interesting. There are accounts from various observers. I quote that of Mr Chas. P. Lounsbury, given in his description of the bont tick.¹ The reader will remember that the genital opening of the female is situated on the under surface in the middle line, a slight distance from the base of the rostrum, and will understand after the description how it came to be said that the tick laid its eggs through its mouth. "When the tick is about to commence egg-laying the middle of the front of the body is drawn back, and thus the genital orifice brought to appear at the front and pointing upward toward the rostrum or mouth organ. The rostrum is depressed into the hollow formed as described, and then all is ready for the actual operation. In this the lining of the orifice turns inside out, and the extruded portion is moved upward as it appears until about half-way over the rostrum; then it stops, and an egg is seen to be protruding from the apex of this singular ovipositor. Meanwhile a pale-coloured glandular organ, cleft for part of its length, protrudes from a cavity situated above the rostrum and just beneath the fore margin of the shield; gradually unfolding its glistening arms this gland extends itself downward, grasps the egg as it leaves the lips of the genital orifice, and immediately rubs it over with a sticky substance. It then retracts, dragging the egg for a short distance with it, but eventually leaving it resting on the rostrum. The genital orifice as soon as it has delivered the egg draws itself in and makes ready to renew the operation. The rostrum, with the palpi at its side, then play a part by rising together and pushing the egg forward and out of the way. The sticky substance causes the eggs to adhere to one another, and thus the mass in front of the body is built up." The egg-laying is spread over a considerable time, the length of time varying with the weather conditions.

Larva.—From the eggs hatch tiny forms with six legs which

¹ The Bont Tick, its Life history and Habits, by Chas. P. Lounsbury. The Agricultural Journal. Cape of Good Hope, November 28, 1899.

ascend grass-blades or collect at the tip of a twig or branch, and here with marvellous patience they wait until a host comes along, clutching at such with outstretched fore-legs, and having been successful in obtaining a lodgment they fix themselves by their rostrum and remain for a time. After some days the larva, showing an increase in size as a result of its having nourished itself at the expense of the host, withdraws its rostrum and drops voluntarily to the ground. Here it remains passive until at last it undergoes the first moult; the skin ruptures and the nymph appears.

Nymph.—The nymph has a stronger rostrum and longer and stronger legs than the larva. The legs now are eight in number. Spiracles or stigmata (openings of the respiratory tubules) are also present for the first time. Sexual organs are not completely developed. The nymph, like the larva, seeks a host somewhat in the same way, and attachment is likewise followed by a period of feeding. Similarly, too, there is the leaving go and the falling away of a larger form which seeks a position of shelter for the next moult. After a time of rest the skin of the nymph bursts and the mature tick appears, either male or female.

Adult Males and Females.—Up to this time the larvæ in the one case and the nymphs in the other have resembled one another, but now sexual organs have been completely developed and we have the two sexes. When the males and females have fixed themselves to some passing host pairing takes place. The mode of copulation is curious. Long ago De Geer, in 1848 Gene, as quoted by Railliet, and in 1899 Mr E. G. Wheler,¹ noticed that in copulation the rostrum and mouth parts of the males are inserted into the sexual opening of the female. This certainly at first sight appears puzzling, but light is thrown on the matter by Gene's observation that at this time two little whitish spindle-shaped bodies were passed by the rostrum, and these bodies were considered spermatophores. We know that in the animal world sometimes the spermatozoa are glued together or packed in little packets called spermatophores previous to their being passed into the female; for example, in *Sepia*, one of the Cuttlefishes, the spermatozoa in packets pass to the modified fourth left arm of the male to be transferred to the mantle cavity of the female. A still better analogy is the case of the spider, because spiders belong to the same animal class as the mites, and because the mouth parts play a part in copulation. In the spider the spermatophores are transferred to the last joint of the maxillæ (pedipalps) of the male previous to their being passed to the female.

¹ Louping Ill and the Grass Tick, by E. G. Wheler. Journal of the Royal Agricultural Society of England. Third Series. Vol. x. pt. iv. 1899.

The male does not die after one act of copulation, but is able to proceed to other efficient acts of pairing. The mature male on the host feeds but does not grow much; the female, on the other hand, with rostrum fixed, rapidly increases in size, swelling it may be to ten times the original size. At last withdrawing the rostrum, the female falls away and proceeds to prepare for and give herself up to the egg-laying.

During the changes there may be variations in colour as well as size, and this is also so as the feeding female swells.

Length of Life in the various Stages.—A characteristic of the ticks in their various stages is their great vitality—their ability to endure long periods of fast until a host is reached. The length of time represented in any one stage—larva, nymph, or adult—varies much with the weather conditions (dryness or moisture) and the temperature, and depends too on the success, speedy or otherwise, in reaching a host. Thus Lounsbury kept larvæ of the bont tick in an empty bottle seven months without their dying; whereas larvæ placed on a host tumbled away to prepare for their moult in, on an average, six to seven days. Wheler kept larvæ of *Ixodes plumbeus* (?) alive for ten months in a bottle containing a little moss and damp sand or damp blotting-paper, and larvæ of the sheep tick in the same way for six months; yet, placed on a sheep, the length of larval life is estimated at only half a week. So, too, with the nymphs. Lounsbury kept them alive away from a host for fifteen weeks, and when placed on a host the nymphs were full fed in time varying from four and a quarter to eight days. Wheler has kept fasting nymphs for six months. Similarly the male and female are able to endure months of waiting for a host. In Lounsbury's experiments with the bont tick, males that had copulated remained attached to the host (a cow) for many weeks.

Ixodes ricinus, the Dog Tick.

Of all the domesticated animals the dog is most subject to tick infestation, especially hunting-dogs. While a few of these parasites may not occasion the dog much inconvenience, their removal is advisable; for should a full-fed fertilised female fall away from the dog in the kennel and proceed there to egg-laying, there will follow a hatching of hundreds of larval ticks which would find a host provided for them in the rightful occupant of the kennel.

Ixodes ricinus (fig. 80), which appears in the literature under various synonyms, receives its name from the resemblance of the swollen female to a castor-oil seed. The female, orange-coloured when fasting and the colour of lead when full fed, has a short rostrum, the dart being rectangular and having on

the sides two rows of eight teeth. The smaller male has only one row of five teeth on each side of the dart.

The pests can easily be removed from the dog by touching with a drop of oil or benzine. I have seen them often pulled ;

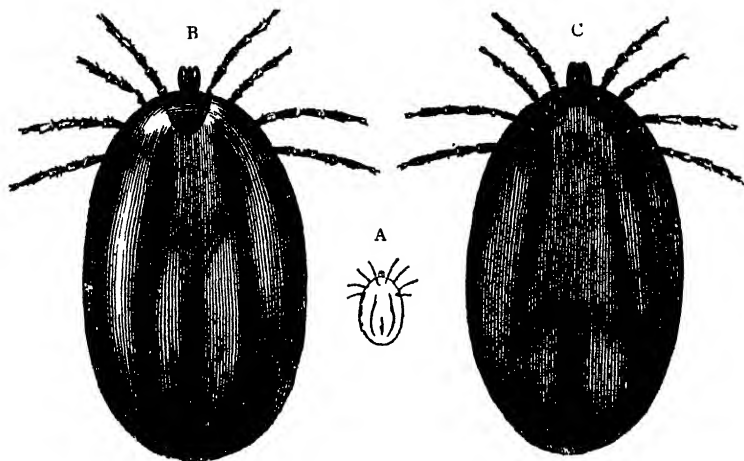


Fig. 80.—*Ixodes ricinus*, full fed female (After Railliet.)

A, Natural size.

B, Enlarged, under surface.

C, Enlarged, dorsal surface.

the unwisdom of this method has been previously pointed out. In the cleansing of kennels, &c., remember the habit of the tick to seek the corners.

Ixodes ricinus, the Sheep Tick.

This tick is best known as parasitic on the sheep. There are records also of its presence on the ox, and more rarely it has been found on the horse and the dog. I quote the description of the different stages given by E. G. Wheeler in his paper.

“*The Egg*.—Length 0.59 mm. by 0.42 mm. in width. Oval, golden brown in colour, smooth and shining. It is covered with a glutinous secretion whereby the eggs adhere together in masses.

“*Larva*.—Length about 0.80 mm. to about 1.50 mm. when fully distended. Body transparent, with olive-green intestinal markings. As it distends it becomes opaque-white, blue-black, and finally quite black.

“*Nymph*.—Length about 1.60 mm. to about 2.30 mm. when distended. Body olive-white, more opaque, with four distinct brown posterior intestinal markings. Also similar anterior ones, leaving a paler centre to the shield shaped liked an

arrow-head. When distended, opaque-white to blue-black, and finally black.

"*Adult Male*.—Length about 2·35 mm. to 2·80 mm. Basal joint of front pair of legs furnished with a spine. Body dark brown, almost black, with brownish white margin. Mottled obscure reddish marks difficult to see, even when magnified. Does not swell like the female.

"*Adult Female*.—Length 2·85 mm. to 3·25 mm. when not distended, to about 10 mm. long by 6·40 mm. wide and 5 mm. deep when fully distended. Basal joint of front pair of legs with longer spine. Legs, shield, &c., dark brown to nearly black. Colour of body deep orange red, and showing four dark longitudinal lines, lighter underneath. Light grey in front, both above and below. Pubescent, opaque, and margined. When distending, light red to reddish grey or even pure white. Fully distended, olive-green, or dark red to black, with irregular yellow streaks on the back and sides when about to lay eggs."

The following, quoted from the same author, gives Mr Wheler's view as to the length of time likely to be occupied in the course of one cycle—i.e., from one egg-laying to the next:—

Stage	Length of life.	How made up.
Larva	13 weeks	1½ week free before reaching a host, ½ week on a host, 11 weeks after having tumbled away and preparing for first moult.
Nymph	13 "	1½ week free, ½ week on a host, 11 weeks after having tumbled away and preparing for second moult.
Adult female	7½ "	1½ week free, 2 weeks on host, 4 weeks after tumbling away to lay eggs.

These figures represent a possible case where all the circumstances—such as good weather conditions and the reaching a host without delay by larva and nymph and female—favoured the tick. The life-cycle, however, may be long drawn out, factors causing variation being the period of the year when the eggs are laid, the nature of the weather—warm or cold, wet or dry—during the larval, nymph, and adult stages, and the uncertain length of the wait before a suitable host comes along for larva or nymph or adult.

The sheep tick chooses as favourite places for anchorage on the sheep the face, root of the ears, the inside of the thighs—i.e., places where the wool is not so thick. *Ixodes reduvius*, however, has its chief importance for us not because of the loss of blood its presence may mean for the sheep, nor for the suppuration from the wound made by the rostrum that might follow removal of the tick, but for the possible part this tick may play in carrying and communicating to the host a serious disease. The experiments of the late Principal Williams in connection with Louping-ill are known to the members of the Highland and

Agricultural Society, and the reasons which led Principal Williams to assign to the tick the rôle of disease-carrier and disease-inoculator are reported in the Society's 'Transactions.'

While work remains to be done in connection with Louping-ill and *Ixodes reduvius*, the important part ticks may play in the spread of disease to the domesticated animals is well exemplified in Texas fever or Red Water, which has occasioned so much loss in cattle in America, South Africa, and Australia. This disease of the blood, caused by a protozoon parasite which destroys the red blood corpuscles, has been proved to be transmitted from infected cattle to healthy cattle by ticks; the progeny of ticks which mature on infected cattle introduce the disease-causing parasite into the blood of susceptible cattle when these ticks wound the cattle by means of their rostrum.

GAMASIDÆ.

This is a family of mites containing members that live freely on the ground, and others which are parasitic. The genus *Gamasus* includes forms which are parasitic on insects, such mites being familiar to insect collectors. The genus *Dermanyssus* (skin-pricker) is characterised by a soft and finely striated body; the mandibles differ in the two sexes—in the male they are didactylous, in the female they are modified to form a piercing stylet. The larvæ of these skin-prickers are 6-legged; multiplication is very rapid. The hosts may be birds or mammals.

Dermanyssus gallinæ, the Hen Mite.

This (fig. 81) is an oval pear-shaped mite which varies in colour from white to red, according as it is fasting or after a meal of blood. The legs are strong and bristly; the body is somewhat flattened, the hind part being widest; the abdomen is surrounded with bristles. The mites live in colonies in hen-houses and pigeon lofts, the colony containing all stages at the same time—larvæ, nymphs, males, females. The hen mites are temporary parasites, hiding in the daytime in crevices and such shelter-places, whence they issue at night and swarm on to the birds, making rest impossible for them. The birds are irritated by the itching which is an accompaniment of the wounding made by the mites' mouth parts. The pests suck the blood, and what makes them more formidable is their ability to subsist for a long time in absence of a live host. Brood hens are worried, and young birds become anæmic and may die. The mite may also invade the nostrils and external auditory meatus.

In addition to attacking the hen and the pigeon, the *Dermanyssus* pricks man, the horse, dog, cat, and goat. A variety infesting the swallow is reported to have passed to some cows, the infection disappearing when some swallows' nests in the byre were pulled down. The pricking of man is followed by a mere temporary irritation, but worse is the effect on the horse. Horses, like fowls, are attacked at night (there is a record of attack on a horse in the daytime, the pests remaining in shelter under a cloth that had not been removed from the horse), the irritation causing an eruption of small vesicles. From continual

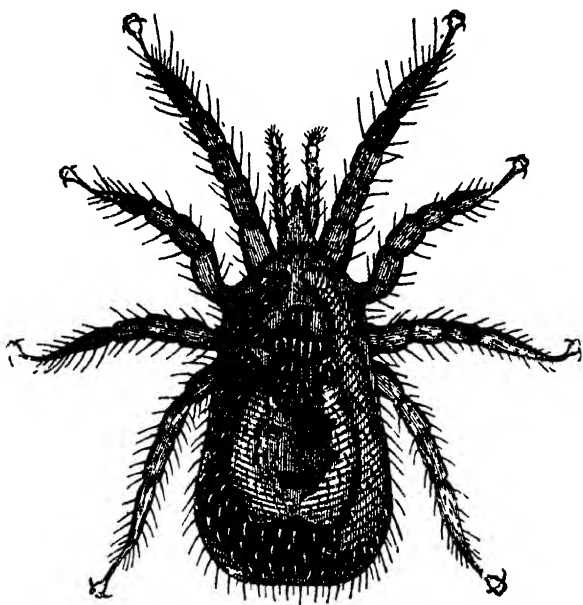


Fig. 81 —*Dermanyssus gallinae*, female. Magnified about eighty times
(After Delafond)

rubbing these get broken, the skin gets raw, and little scabs and ulcerations result. In this stage there is the chance that the *Dermanyssus* attack may appear really to be the work of the *Sarcoptes* of the horse, but with the *Sarcoptes* as pest itching would be much severer and the disease more widespread, with a greater falling out of hair and a running together of crusts.

Treatment. — Do not allow fowls into the stables at night. Bathe with a 5-per-cent solution of chlorhydrate of ammonia. To keep fowls free let there be a regular cleansing and disinfecting of their houses and perches.

Pentastomum tæniodes.

This curious creature, measuring up to three-quarters of an inch in length, is placed by itself as a sort of outlying member of the Arachnoidea. The body of *Pentastomum* is worm-like and ringed, and has two pairs of movable hooks. The sexes are separate. This parasite is found in the nasal cavities of the dog. Here the eggs are laid, and then pass to the outside with the mucus. The embryo does not hatch till the egg is eaten by some intermediate host—*e.g.*, a herbivorous animal, like the rabbit or sheep. In the stomach of the herbivore the egg-shell is digested and the larva set free. This larval has two pairs of truncate hooked limbs. By means of a boring apparatus the larva passes through the wall of the gut of its host and passes to the liver or mesenteric glands or lungs, there it settles in a capsule and undergoes several moults. Development is slow, but after some months a second larval form is attained—viz., *Pentastome denticulatum*, with transverse rows of chitinous hooks. This form freed from the cyst is still unable to attain sexual maturity until the host containing it be eaten by another animal, say a rabbit by a dog. In such a case the larva moults, loses its hooks, and finally reaches the adult form.

Two books which I have several times named in the course of this communication may be recommended to members of the Society who desire to read in detail concerning the Animal Parasites—viz.,

Neumann's Parasites and Parasitic Diseases of Domesticated Animals. Translated by George Fleming, LL.D. Ballière, Tindall, & Co.; and

Traité de Zoologie Medicale et Agricole. By A. Railliet (Asselin & Houdean.)

OLD AND NEW VARIETIES OF OATS.

By JOHN SPRENG, Newton, Glasgow.

IN 1898 and 1899 several of the new varieties of oats were tested here, the results of which are recorded in the 'Transactions' of 1900. In these years the Potato oat was used as a basis of comparison with the others, but on this occasion Hamilton oat was employed. Where the straw is used as fodder it is usually considered superior to Potato. Personally

I could never see any difference between them, other than what could be accounted for by a change of seed, although I had often grown them side by side. In 1898 the yield was abnormally high, and in 1899 it was just as far below the average; it was, therefore considered desirable to continue the test at least one year longer. As in previous years, the plots were generally $\frac{1}{2}$ acre in extent, American Beauty and Waverley (west) alone being of $\frac{1}{2}$ acre.

In 1899 the land had produced two crops of Italian ryegrass hay, and as soon as the second crop was put up, from 10 to 12 tons per acre of stable manure were spread on the land. The aftermath from this manure was considerable, and was eaten off with sheep till Christmas. The land was ploughed in January, and no artificial manures of any kind were applied to any of the plots. The soil of all the plots is very light, and rather inclined to be gravelly, but very uniform in every respect. The plots were in the centre of a 20-acre field, and none were in any way more exposed or sheltered than the others.

The plots were so arranged that in the ploughing there were neither beginnings nor finishes in any of them, with the exception of the plots of American Beauty and Waverley (west), which, being $\frac{1}{2}$ -acre plots, had a beginning in the centre. All the other beginnings and finishes were used as paths, spaces $2\frac{1}{2}$ feet wide being left unsown between and around every plot. These bare paths were hoed several times during the season to keep them clear of weeds. On this class of land sowing is generally carried out here in the latter half of March; but owing to two lots of seed having failed to arrive, it was delayed till 2nd April, in the hope that all might be sown the same day. At that date the Banner seed, which was coming from the Central Experimental Farm, Canada, and the Gold-finder from Messrs Gartons' farm, had not arrived; and as all the ordinary oats had been seeded, it was thought desirable to sow those varieties which were available. Seeding was done with the drill, the day being fine, and the land in good working order. Two spaces were left for the seed which was awaiting, but owing to delay in its arrival, and then to wet weather, it could not be sown till 21st April, almost three weeks after the others, and by which time the whole of the first sown plots were braided.

When fairly through the ground, all the varieties seemed to be about the same thickness; but where home-grown seed and seed from Messrs Garton were sown alongside of each other, the new seed seemed if anything to give a trifle thicker plant, although sown with from $\frac{3}{4}$ bushel to $1\frac{1}{4}$ bushel per acre less than the other.

The straw of each variety was measured for length when the

crop was fully grown, and before any of it had begun to lie down. Neither Banner nor Goldfinder ever looked well, both being badly clogged with spurry, to which this piece of land is very liable. Owing, however, to the earlier sowing, it caused no trouble to the other varieties; but between the spurry and the late sowing, the test is of no value as far as Banner and Goldfinder are concerned. Goldfinder is said to be sufficiently hardy to enable it to be sown as a winter oat in the south of England, and it is consequently better fitted for sowing early than late in Scotland. The plot marked Waverley (west) was sown on land which had been green cropped the previous year, and to that extent it differs from all the other plots.

After the flowering period it was noticed that very many of the ears of Hamilton oat had not been fertilised, and consequently were quite empty and white. The same peculiarity was noticed with Potato oat in 1899, but never before, although it is quite possible such might have occurred without its being noticed. No unfertilised or white ears were noticed in any of the other varieties, either last year or in the year before. The Banner variety was very bad with smut, and its yield must have been reduced from 20 per cent to 30 per cent from this cause alone. Each variety was cut as soon as it was ripe, the three first ripened lots being cut by the scythe, and the others by the manual reaper.

The following table shows the amount of seed sown per acre, and the number of days which elapsed between the sowing and reaping of each variety:—

Variety.	Seed per acre in bushels.	Number of days from sowing to reaping.
Waverley, new seed . . .	4 $\frac{1}{4}$	144
" home seed . . .	5	144
Tartar King, new seed . . .	4 $\frac{1}{4}$	133
Abundance, new seed . . .	4 $\frac{1}{4}$	138
" home seed . . .	5 $\frac{1}{2}$	138
American Beauty, home seed . . .	4 $\frac{3}{4}$	144
Hamilton, local seed . . .	4 $\frac{1}{2}$	144
Goldfinder, new seed . . .	4	135
Banner, new seed . . .	4	142
Waverley (west), home seed . . .	5	144

The following table shows the produce of each variety, weight per bushel, length of straw, &c.:—

TABLE SHOWING THE PRODUCE OF EACH VARIETY OF OAT FOR SEASON 1900.

Variety.	Length of straw in inches.	Weight of straw per acre tons cwt lb	Per cent of straw to grain	Grain per acre in bushels of 40 lb.		Total bushels per acre.	Weight in lb. per bushel.	Per cent of grain to straw.	Area of each plot in acre.
				Dressed.	Light				
Waverley, new seed . . .	54-60	2 1 49	65.8	57 $\frac{5}{10}$	3 $\frac{6}{10}$	60 $\frac{1}{10}$	39	34.2	$\frac{1}{2}$
" home seed . . .	54-60	1 19 35	67.3	50 $\frac{2}{10}$	2 $\frac{4}{10}$	53 $\frac{10}{10}$	38	32.7	$\frac{1}{2}$
Tartar King, new seed . . .	48-51	1 2 5 30	65.2	64 $\frac{3}{10}$	2 $\frac{8}{10}$	67 $\frac{3}{10}$	38	34.8	$\frac{1}{2}$
Abundance, new seed . . .	51-54	2 2 81	63.7	65 $\frac{2}{10}$	2 $\frac{0}{10}$	68 $\frac{0}{10}$	40	36.3	$\frac{1}{2}$
" home seed . . .	51-54	2 4 7	68.8	53 $\frac{3}{10}$	1 $\frac{4}{10}$	55 $\frac{3}{10}$	39	31.2	$\frac{1}{2}$
American Beauty, home seed . . .	54-60	2 6 98	69.3	54 $\frac{1}{10}$	3 $\frac{8}{10}$	58 $\frac{8}{10}$	35	30.7	$\frac{1}{2}$
Hamilton, local seed . . .	51-57	2 5 27	74.3	41 $\frac{4}{10}$	3 $\frac{1}{10}$	44 $\frac{1}{10}$	41	25.7	$\frac{1}{2}$
Goldfinder, new seed . . .	48-54	2 2 4 87	72.7	51 $\frac{0}{10}$	6 $\frac{4}{10}$	57 $\frac{2}{10}$	38	27.3	$\frac{1}{2}$
Banner, new seed . . .	48-51	1 9 26	81.9	322 $\frac{1}{10}$	1 $\frac{7}{10}$	232 $\frac{1}{10}$	37	18.1	$\frac{1}{2}$
Waverley (west), home seed . . .	54-60	2 1 94	64.9	60 $\frac{2}{10}$	2 $\frac{4}{10}$	63 $\frac{0}{10}$	42	35.1	$\frac{1}{2}$

On hay-stubble land.

Green-cropped land.

On hay-stubble land.

Green-cropped land.

¹ The total weight of straw and chaff is probably a little over-estimated owing to dampness of straw in the bottom of the stack.

² Weight considerably increased by spurry.

The following is the average total yield of each variety during the years they have been tested here:—

Variety	Average yield for 3 years in bushels	Average yield for 2 years in bushels.	Greatest yield in bushels.	Least yield in bushels.
Waverley .	68 $\frac{1}{2}$ ₄₀	...	101 $\frac{8}{40}$	46 $\frac{1}{2}$ ₄₀
Tartar King .	67 $\frac{3}{4}$ ₄₀	...	94 $\frac{1}{4}$ ₄₀	41 $\frac{1}{4}$ ₄₀
Potato . .	49 $\frac{1}{2}$ ₄₀	..	63 $\frac{5}{40}$	40 $\frac{1}{4}$ ₄₀
Pioneer .	..	62 $\frac{1}{4}$ ₄₀	87 $\frac{1}{4}$ ₄₀	37 $\frac{1}{4}$ ₄₀
Abundance .	...	62	68 $\frac{9}{40}$	43 $\frac{3}{4}$ ₄₀
Goldfinder .	...	53 $\frac{2}{4}$ ₄₀	57 $\frac{2}{4}$ ₄₀	49 $\frac{3}{4}$ ₄₀
American Beauty .	.	54 $\frac{1}{4}$ ₄₀	58 $\frac{8}{40}$	46 $\frac{1}{2}$ ₄₀

Tillering Power.

When in full ear the plot of Hamilton oat seemed to be the thickest, closely followed by American Beauty. A more minute examination, however, showed that nearly every plant of Hamilton oat carried two or more stalks, while few of American Beauty had over two. The tillering power of Waverley seemed somewhat less than American Beauty, it and Goldfinder being somewhat alike, but all three being a considerable distance behind Hamilton. There did not seem to be much difference between Abundance (sometimes named Newmarket) and Tartar King. Neither of these seem to have much tillering power, as it was very seldom a plant had two or more stalks, the majority having only one. In this respect these two varieties were a long way deficient, compared with Hamilton. The notes made during 1898 and 1899 all corroborate the remarks made this year.

Power of the Straw to remain standing.

In its power to remain erect Tartar King took first place easy, as at no part did any of the plot lie down. During the three seasons it has been cultivated here it has gone down only in isolated spots. As far as my experience goes, no other oat compares with Tartar King for remaining erect on heavily manured land. Goldfinder and Banner also stood well, but these being later, the comparison was not reliable. In another

field, where lodging was almost certain to happen with any variety of oat, Tartar King was put to a severe test in that respect, and came through fairly well. Waverley on land after turnips was very much stiffer in the straw than on the lea-land, and although giving the largest yield of any of the plots of this variety, it had scarcely any laid, while the other two had a good deal. There was little difference between Hamilton, Waverley, and American Beauty, what difference there was being in favour of Hamilton.

Abundance was flat from end to end of both plots, it being the first down and the closest laid of any of the varieties tried. Abundance was growing alongside of Tartar King, and while the latter had not a single stalk down, the former had not one standing. Abundance when laid generally bends over from the root, and very often all in one direction. Tartar King, if allowed to get fully ripe, seems to become very weak above the last knot or joint—that is, the one under the ear,—weaker still if over-ripe. The wide portion of the tube of the straw seems very weak there, and if subjected to rough weather breaks very readily, causing the crop to have a very knocked-about appearance, and considerably increasing the cost of harvesting. In the stook the straw doubles up and the ears drop down, giving the stooks a very huddled and untidy appearance, and if they once get wet they are not easily dried.

Quantity and Quality of the Straws.

As stated in a footnote on the table giving the total produce of each, the weight of straw of Goldfinder is somewhat misleading, as a considerable amount of spurry was among the straw. Tartar King had the shortest straw of any of the varieties, the total weight per acre being, however, high. The amount stated is, I think, also misleading, as this variety was in the bottom of the stack, and a portion of the bottom course was damp. With these two qualifying statements, the weights may be looked on as reliable for the different varieties, under conditions similar to those existing here during the past season.

Hamilton and Goldfinder stood up in the stook much better than any of the others. The tube of the straw of Goldfinder seems much smaller than that of Hamilton, while at the same time it is stout, yet pliable, and with little liability to break. The straw of this variety seems superior to any of the other oats of recent introduction. Waverley after turnips had also excellent straw, but on the other plots it was not so good, the quality of it and American Beauty being about alike. Abundance has a very brittle straw, and Tartar King is even more so. The straw of Tartar King especially is very much improved,

from a fodder point of view, if the seeding is very thick; but even where all the conditions are favourable, the straw is only third class.

Most oats can with advantage be generally cut before being fully ripe, and more especially is that the case with Tartar King. By doing so the straw is improved and much grain is saved, as owing to its weak attachment to the straw, much of it is shed in the handling, more especially if exposed to wet weather. Goldfinder, on the other hand, has a very firm attachment to the straw, and on that account may be allowed to stand till fully ripe without any fear of shedding in the handling. From the appearance of the straw and grain, it may be found that this variety will be useful for exposed situations, such as where Sandy oats are generally grown at the present time, as in many respects the two varieties correspond. In the colour of the grain they however differ, Goldfinder being a bright yellow, while Sandy is slightly brown.

Grain.

As will be noticed from the table on p. 279, the varieties having thick plump grain—viz., Tartar King and Abundance—have given the heaviest yield. Where the seed in both cases was from the same source, the total yield of Abundance is about $\frac{1}{2}$ bushel greater than that of Tartar King. Hamilton from local seed gives much the lowest yield of any of the varieties tried. In the production of light or small grain, with one exception, there has been no great difference between any two of the varieties. That exception is Goldfinder, where the amount is about double the others. It has a somewhat long and very thin grain with a thin husk, hence the large proportion of it which was separated as small grain. Of this a considerable proportion was large enough to be likely to grow if it were sown as seed. The weight of light and small grain in every case was principally regulated by the small grain, as the amount of light grain did not differ materially in any of the varieties. Besides passing through the ordinary sieves of the hand-fanners, all the grain was passed over a Bobby machine, and it was when passing over the latter that the greater proportion of the small grain was separated. The plump varieties having thick husks, like Tartar King and Abundance, had rather less grain capable of passing between the wires of the Bobby machine than the longer and thinner-skiinned varieties, such as Waverley, American Beauty, Hamilton, or Goldfinder. The small grain of Tartar King and Abundance was, however, smaller in proportion to the dressed grain than that of most of the thin-grained varieties.

Weight per Bushel.

Among the varieties sown on the lea-land, Hamilton had the greatest weight per bushel—viz., 41 lb., although Waverley on green-cropped land reached 42 lb. No attempt was made at special dressing, other than to take out the small grain, and the bushel weights should therefore be looked on only as what might be expected under such conditions of land, manuring, and season as existed here in 1900. Under other circumstances the weights per bushel might be very much up or down.

Colour and Quality of Grain.

None of the other varieties had the fine white colour and bright clean skin of Hamilton. The nearest approach to it was Waverley on the green-cropped land, but it had rather less lustre than Hamilton, although the proportion of husk might not materially differ. That matter will be dealt with by Dr Aitken in his report. The thicker husked varieties, like Tartar King and Abundance, were all dull in colour compared with Hamilton. Goldfinder had a bright yellow husk, which approached in lustre that of Hamilton. Its grain is rather thin, and being yellow, it may not take the popular fancy so readily as a white variety or one more plump. Abundance from new seed gave the highest percentage of grain to straw, and, excluding Goldfinder and Banner, Hamilton was the lowest. In all the plots Waverley comes out remarkably well in that respect, which is surprising when it is considered that it had the longest straw of all the varieties tried.

New Varieties versus Old.

Taking Hamilton as a good representative of one of the old varieties, the experiment clearly demonstrates the superiority of the new varieties, at least as far as grain production is concerned. Excluding Waverley (west), Banner, and Goldfinder, the average of the other new varieties is $60\frac{2}{3}$ bushels, while that of Hamilton is $44\frac{1}{3}$ bushels. This is a gain of $16\frac{1}{6}$ bushels per acre, or 41 per cent. In the production of kernel or meal I expect Hamilton will yield a higher percentage than most of the new varieties, but it is very likely that even the worst of the new sorts will produce more kernel or meal per acre than Hamilton does. All weight in grain is not gain, as the real test of any variety, as far as grain is concerned, is the amount of food in kernel or meal it produces per acre. That point is being inquired into by Dr Aitken, and will be fully dealt with in his report, which is appended.

Advantage of Changing Seed

Besides testing the various varieties, the opportunity was taken to compare the produce of seed recently purchased with the produce of that grown on the farm for two seasons. Only two varieties could be compared in this way, but as far as it goes the experiment, as is seen in the following table, clearly indicates the advantage to be gained by changing seed frequently.

CHANGED *versus* HOME-GROWN SEED.

Variety	Weight per bushel in lb	Dressed grain in bushels per acre	Small grain in bushels per acre	Total bushels per acre.	Straw and chaff per acre in cwt
Abundance, new seed .	40	65 $\frac{1}{2}$ ⁰	2 $\frac{1}{2}$ ⁰	68 $\frac{1}{2}$ ⁰	42 $\frac{3}{4}$ ¹ ₂
" home seed .	39	53 $\frac{1}{2}$ ⁰	1 $\frac{1}{2}$ ⁰	55 $\frac{1}{2}$ ⁰	44 $\frac{1}{2}$ ⁰ ₂
Waverley, new seed .	39	57 $\frac{1}{2}$ ⁰	3 $\frac{1}{2}$ ⁰	60 $\frac{1}{2}$ ⁰	41 $\frac{4}{11}$ ⁰ ₂
" home seed	38	50 $\frac{1}{2}$ ⁰	2 $\frac{1}{2}$ ⁰	53 $\frac{1}{2}$ ⁰	39 $\frac{1}{11}$ ⁰ ₂
Average of new seed	39 $\frac{1}{2}$	61 $\frac{1}{2}$ ⁰	2 $\frac{1}{2}$ ⁰	64 $\frac{1}{2}$ ⁰	42 $\frac{1}{11}$ ⁰
" of home seed .	38 $\frac{1}{2}$	52 $\frac{1}{2}$ ⁰	2 $\frac{1}{2}$ ⁰	54 $\frac{1}{2}$ ⁰	41 $\frac{7}{11}$ ⁰
Gain in favour of new seed .	1	9 $\frac{1}{2}$ ⁰	1 $\frac{1}{2}$ ⁰		

ANALYSES OF OAT-STRAW AND OATS.

By Dr A. P. AITKEN, Chemist to the Society.

THE analyses of the samples of straw (grown in Mr Speir's experiments reported upon in the foregoing paper) as shown on Table I. exhibit a greater range of composition than one would expect, seeing that they were all, with one exception, grown on the same soil and under exactly similar conditions as to manurial treatment. The one exception is the Waverley, old seed—viz., the seed of 1897—grown to the west on a part of the field which in the previous year had grown a green crop, while the rest had grown grass cut for hay. The chief peculiarity of that sample of straw is its poorness in nitrogenous constituents, which would seem to indicate that the green crop had been entirely removed, and that its removal had left the land exhausted to a greater extent than the rest

in nitrogenous matter. An oat crop is a fairly good tell-tale of the state of fertility of a soil, and indeed it has sometimes been used for that purpose, not only to indicate the richness of the soil in nitrogenous matter but also in available mineral ingredients. In this case, however, the treatment of the land in growing a green crop would establish such a difference between it and the rest of the field that had been under grass the previous year, both in physical condition and in the distribution of the manurial ingredients and moisture, especially in a vertical direction, that it would only lead to error to compare it with the other plots, and it is right that it should be removed altogether from the comparative survey, whose object is to discover if there are any notable differences in the composition of the samples of straw due solely to the differences in the variety of the seed used.

The samples of Goldfinder and of Banner must also be removed from the comparative survey owing to the difference of three weeks in the date of sowing. Even a difference of three days might have been sufficient to disqualify them for the purpose in view, for the various conditions comprised under the term *tid* might have greatly altered during that short time. Neither can these two varieties of straw be profitably compared with each other, seeing that the Banner variety was so badly affected with smut. Owing to these circumstances the analyses of these straws, and also the grain of them, have been removed to the lower part of the various tables.

In comparing the analyses of the remaining seven samples it will be convenient to consider the various columns in their order, and see if the differences observed shed any light on the peculiarities observed by Mr Speir in his paper.

Nitrogenous Matter.

The first column shows the *crude protein*—that is to say, the total amount of the nitrogenous matter reckoned as albumen. The figures are the sum of the two columns which follow, and in which are stated the percentage of actual albumen and that of the amides and any other non-albuminoid nitrogenous constituents. For the sake of comparing these latter constituents they are expressed in their equivalent of albumen. They comprise substances that are on the road to albumen, and which would perhaps have been converted into albumen in great measure had the ripening process been continued, but which have stopped short of albumen either owing to slowness of ripening or some other quality inherent perhaps in the variety of the seed or in its condition or its age. It will be noticed that the straws grown from the new seed of the *Waverley* and

the *Abundance* have a greater proportion of immature nitrogenous matter than the straws grown from the old seed of those varieties, but that may be due to some other cause than the age of the seed. Nothing definite can be said on that point until it is proved by numerous experiments.

There need be no doubt of this, that the richer a sample of straw is in albumen so much the better is it as a fodder. That is the constituent in which straw is naturally most deficient, and while it has been ascertained that amides do to a limited extent resemble albumen in their nutritive properties, they are not so valuable as albumen, and their nutritive value decreases rapidly according as they encroach more and more upon the albumen. The *Waverley* new seed has nearly one-third of its nitrogenous matter in the amide form, while the *Waverley* old seed has only about a fifth of its nitrogenous matter in that immature condition. That being so, and seeing that the crude protein is about the same in both, we need not hesitate in giving the preference to the straw of the old seed as a nutritious fodder unless there should be some other disadvantageous quality to counteract its superiority in albumen. There is nothing of that kind, for in other respects the two are very similar.

On comparing in a similar manner the old and new seed of *Abundance*, it is seen that as regards true albumen they are very nearly on an equality; but in crude protein the new seed has a great advantage, and it also is richer in fatty substances, and I would therefore consider the straw of the new seed a better fodder than the other.

But the straw which surpasses all the others in feeding properties is that of the *Hamilton* oat. It has the largest proportion of crude protein and also of actual albumen. Only one-fifth or so of the nitrogenous matter is of the non-albuminoid kind, showing that it has been well ripened. Moreover, it also exceeds all the others in the proportion of fatty substances, and these are second in importance to the protein. These substances are not all fat nor so nutritious as fat. They are the substances extracted from the straw by hot ether, and include some waxy matters and also chlorophyll, which is the green colouring matter of young straw. This sample had probably rather more chlorophyll than the average, for it contained an unusual number of slender, greenish stalks, many of which had not yet shot.

The Effect of Tillering.

Mr Speir observed that it tillered better than the other varieties, and the result of that tillering has been to produce a considerable proportion of thin late-flowering stalks, whose grain, if it bore any, would be mostly of a small light kind.

As a consequence this variety produced by far the largest proportion of light grain—viz., about one-thirteenth of the total yield. But the thin late-flowering straws, which produced little or perhaps no seed, still retained within them the albumen and other matters which would have gone to make seed had they attained full growth, and thus it is that the *Hamilton* straw is richer than the others, and also that it shows the largest proportion of straw to grain. But what has been gained to the straw has of course been lost to the oats, and it has given the poorest yield of grain per acre of all the varieties. It thus appears that good tillering is no unmixed benefit, and that a plant may expend too much of its strength in that process—and indeed the tillering habit may be distinctly disadvantageous if the purpose for which the crop is grown is to obtain the largest quantity of fully ripened grain of good size.

American Beauty resembled *Hamilton* in containing an unusual amount of green-coloured and imperfectly grown straws, and as a consequence it also produced a high proportion of light grain. Mr Speir observed that it was second to *Hamilton* in tillering power, and it is also second to *Hamilton* in the percentage of straw to grain.

Tartar King is seen to be somewhat inferior in albumen, and the proportion of amides is not far off one-third of the crude protein. It has an exceptionally high proportion of ash, and does not have the appearance of what would be considered a good feeding straw. It is a very coarse straw, and a large proportion of its organic matter is woody fibre, to which circumstance I believe more than to its shortness it owes its standing power; and it will be observed that *Waverley* (west), which was about equal to it in standing power, is also a very fibrous straw. It is my opinion that it is to the abundance of woody fibre that the straw of cereals owes its standing power. Abundance of woody fibre in a straw is a useful characteristic in adding to its strength without diminishing its value as a fodder, for it has been clearly proved by means of feeding experiments that the woody fibre of oat straw is digested quite as well as, or even better than, the allied carbohydrates. Whether much woody fibre is appreciated by cattle is another question. What is chiefly wanted in straw as a fodder is that it should be appetising, and any seeming superiority that may be discovered in a straw by chemical analysis is of no account if the stock refuse to eat it. It would be well in future experiments to put that test in practice, and it can be easily done by merely exposing in a cattle-court large samples of the various straws and noting which of them was most eaten. Failing such a test we must fall back on chemical analysis, and I daresay we shall not go far wrong in making the albumen and the fat our

gauge of feeding value. Guided by that consideration, the following would be regarded as the order of merit:—

Hamilton.
 Abundance, new seed.
 Tartar King.
 { Waverley, old seed.
 { Abundance, old seed.
 Waverley, new seed
 American Beauty.

Such an arrangement would indicate, perhaps, the relative feeding value of the different straws if eaten alone, but when eaten along with other fodder their relative positions might be different—the advantage would rest with those which were most greedily consumed.

The quantities of these straws produced per acre differed about as widely as their chemical analysis, and it is worth while to notice their order of productiveness as regards the amount of proteids produced per acre. Assuming that all the samples had an average amount of moisture, the amount of proteids per acre in pounds were—

Hamilton	203
Abundance, new seed	157
American Beauty	150
Tartar King	149
Waverley, new seed	147
" old seed	144
Abundance, old seed	135

Here *Hamilton*, owing to its greater tillering propensity, takes a very long lead, but it will be seen immediately that its deficiency in grain went far to counterbalance its superiority in straw.

Analysis of the Grain.

On Table II. are given the analyses of the entire oats. It is evident at a glance that the differences in the composition of the grain samples are not so marked as in the case of the straws. But that is just what was to be expected according to the law of nature. All the efforts of the plant are determined towards, and its other parts sacrificed for, the perfecting of the seed that contains the germ, on whose supply of nourishment depends the continuance of the race. Perhaps the most noteworthy peculiarity of these samples of grain is the large amount of moisture they contain. Oats when well won should contain only about 14 per cent of moisture, but the average here is nearly 17 per cent, and *Tartar King* has nearly 19 per cent. It tells the tale of a wet harvest and damp stacks; but as that is an accidental circumstance, it must not be allowed to affect the other con-

stituents, and accordingly the analyses are expressed in percentages of the grain when entirely deprived of moisture. The grain has retained its moisture more tenaciously than the straw, and if the seed has not swollen to some extent owing to its dampness, an increase of from 3 to 5 per cent in moisture ought to make a very perceptible difference in the weight per bushel.

Crude Protein.

The amount of crude protein in the grain ranges within narrow limits,—from 13½ to 14 per cent,—and the greatest variation is seen in the different samples of *Waverley*. That grown from the home seed of 1897 is richest in nitrogenous compounds, but nearly 2 per cent is amide. The other samples of *Waverley* are also distinguished by containing an unusual proportion of amide or non-albuminoid nitrogenous matter.

Oil.

The constituent that is subject to greatest variation is the oil—a most important constituent in oats; but owing to the very dissimilar amounts of oil contained in the same variety of seed, it seems to be less affected by the variety of the seed than by other circumstances. The old seed of *Waverley* and *Abundance* have produced a grain much richer in oil than the new seed, but that may be nothing more than a coincidence; and the *Waverley* (west) grown after a green crop is far richer in oil than either of the crops grown after hay; but that also may be an accident. Seeing that such extremes occur in different lots of the same variety of seed, it seems evident that the quantity of oil in oats is not a matter dependent on the variety of seed used, and a much larger induction would be required in order to discover any rational explanation of the differences observed in these samples. Any differences of note will be best seen on comparing the figures on Tables III. and IV., where are given the analyses of the husk and the kernel of the oat samples separately.

Proportion of Husk to Kernel.

The proportion of husk to kernel, as shown on the last column of Table III., is a pretty variable quantity; but here again the three samples of *Waverley* inform us that we must not be too hasty in regarding the proportion of husk to kernel as a specific peculiarity. In this variety the proportions are about 23, 24, and 25 per cent, according to circumstances, partly of seed and partly of soil. The thinnest husks are those of *Abundance* and the two late-sown varieties, *Goldfinder* and *Banner*, and the thickest are those of *Hamilton* and *Tartar*

King. The old seed of *Abundance* and *Waverley* have produced thinner husks than the new seed. Upon the whole, it seems highly probable that as regards the proportion of husk to kernel those are differences appertaining to the different varieties.

On comparing the analysis of the husks with those of the straw it is seen that they are pretty much alike. The husks contain a little less oil and ash but more carbohydrates, and in other respects the differences are unimportant.

Analyses of Kernels.

The analyses of the shelled oats or kernels in Table IV., as they are the most important part of the plant, deserve somewhat minute inspection. In these the nitrogenous matter is almost entirely albumen, the only sample showing any notable amount of non-albuminoid nitrogenous matter being the *Waverley*, especially the sample grown from old seed, and it is seen that as regards albumen the *Waverley* as a whole is somewhat inferior to the other varieties. *Tartar King* in this respect takes the lead with 17.5 per cent of albumen and only a third of 1 per cent of non-albuminoid nitrogenous matter. It has evidently been better ripened than any of the others, and though it is not so rich in oil as some of the others, it may, perhaps claim to be as good as the best in feeding quality.

Among these high-class grains it is very difficult indeed to say which is the best. *Tartar King*, *Abundance* new seed, and *American Beauty* strive hard for the first place, and it would require repeated trials conducted under different conditions to enable any preference to be given. Moreover, I should like to give a few grains of each kind into the hands of a practical miller before attempting to arrange them in order of merit.

Taking the crude protein as a rough measure of feeding value, it is of some interest to notice what amount of it has been produced per acre by the oats, the husks, and the straw of each variety.

CRUDE PROTEIN PER ACRE IN POUNDS

	Kernel.	Husks.	Straw.	Total.
Waverley, new seed	227	15	126	368
" home seed	226	11	124	361
Tartar King, new seed	277	13	128	418
Abundance, new seed	289	16	135	440
" home seed	231	9	116	356
American Beauty	237	12	129	378
Hamilton, local seed	176	11	174	361

We see from this synopsis that the *Abundance* new seed takes the first place with a very good lead, and I may remark that, so far at least as regards the grain, it seemed to me the largest, plumpest, and most attractive of all the samples, and I thought *Hamilton* came next. As regards *Hamilton*, despite the fact that it produced the smallest number of bushels per acre, owing probably to the circumstance noticed by Mr Speir, that it contained a large proportion of empty ears, yet owing to the greater quantity and higher quality of the straw it has produced a very satisfactory amount of total albuminoid food. The probability is that if the ears of *Hamilton* had been better fertilised it might have had a good chance of taking the first place as a food producer. A very remarkable circumstance is the great difference in food production of the new seed and the home seed of *Abundance*. As between new and old seed there seems to be much to be learned, and the whole subject is one that would repay continued and more complete investigation.

[TABLES.

TABLE I.—ANALYSES OF OAT STRAWS (dried at 212° F.)

	Crude protein.	Albumen.	Amides= albumen	Oil, &c	Carbo- hydrates.	Woody fibre	Ash	Moisture in un- dried sample.
Waverley, new seed	3.17	2.17	1.00	2.65	54.20	33.48	6.50	13.80
" home seed	3.28	2.62	.66	2.85	53.89	33.85	6.13	15.60
Tartar King, new seed	2.95	2.07	.88	3.58	48.47	34.25	10.75	14.52
Abundance, new seed	3.29	2.29	1.00	3.85	52.83	33.03	7.00	15.60
" home seed	2.73	2.18	.55	3.35	54.42	33.35	6.15	15.20
American Beauty, home seed	2.85	2.19	.65	2.23	54.78	34.30	5.85	15.80
Hamilton, local seed	3.94	3.06	.88	4.25	52.56	32.97	6.28	15.25
Goldfinder	3.28	2.62	.66	4.50	49.94	34.75	7.53	16.52
Banner	2.84	1.86	.98	3.08	55.46	32.30	6.32	15.72
Waverley (west), home seed	2.08	1.75	.33	4.20	49.32	37.27	7.13	15.15

TABLE II.—ANALYSES OF ENTIRE OATS (dried at 212° F.)

	Crude protein.	Albumen.	Amides = albumen.	Oil, &c.	Carbo-hydrates.	Woody fibre.	Ash.	Moisture in undried sample.
Waverley, new seed	12.73	11.36	1.37	6.68	66.97	10.53	3.09	16.78
" home seed	14.05	12.15	1.90	4.83	67.10	10.27	3.75	16.48
Tartar King, new seed	13.78	13.31	.47	6.39	66.11	11.36	2.36	18.83
Abundance, new seed	13.89	13.10	.79	8.38	66.77	8.16	2.80	16.48
" home seed	13.47	12.70	.77	6.56	66.90	9.98	3.19	17.83
American Beauty, home seed	13.74	12.80	.94	7.97	65.22	10.37	2.70	16.53
Hamilton, local seed	13.58	12.56	1.02	4.94	68.46	10.04	2.98	16.23
Goldfinder	13.83	13.01	.82	4.87	69.54	8.25	3.51	16.03
Banner	13.73	13.00	.73	6.78	68.59	8.20	2.70	17.05
Waverley (west), home seed	12.44	11.15	1.29	8.04	67.07	9.23	3.22	16.75

TABLE III.—ANALYSIS OF HUSKS OF OATS (dried at 212 F.)

	Crude protein	Albumen.	Amides= albumen.	Oil, &c.	Carbo- hydrates.	Woody fibre.	Ash.	Proportion of husk to kernel.
Waverley, new seed . . .	3.06	2.19	.87	2.45	58.19	30.70	5.60	25.15
" home seed . . .	2.84	2.19	.65	1.30	60.26	29.00	6.60	24.09
Tartar King, new seed	2.41	1.53	.88	2.50	58.84	33.15	3.10	26.18
Abundance, new seed . . .	3.26	2.40	.86	2.45	60.22	29.85	4.20	22.44
" home seed . . .	2.41	1.97	.44	1.50	60.69	30.30	5.10	22.11
American Beauty, home seed	2.84	2.62	.92	1.56	59.70	32.10	3.80	24.97
Hamilton, local seed . . .	3.28	2.41	.87	2.25	58.97	30.30	5.20	26.27
Goldfirdler . . .	3.72	3.06	.66	2.75	59.28	27.35	6.90	22.95
Banner . . .	2.62	1.97	.65	2.20	60.63	29.65	4.90	22.45
Waverley (west), home seed . . .	2.62	1.75	.87	1.25	58.68	31.25	6.20	23.27

TABLE IV.—ANALYSES OF KERNELS OF OATS (dried at 212° F.)

	Crude protein.	Albumen.	Amides = albumen	Oil, &c.	Carbo- hydrates.	Woody fibre.	Ash.	Proportion of kernel to husk.
Waverley, new seed	. . . 15.97	14.44	1.53	8.10	69.93	3.75	2.25	74.85
" home seed	. . . 17.61	15.31	2.30	5.95	69.27	4.32	2.85	75.91
Tartar King, new seed	. . . 17.83	17.50	.33	7.50	69.07	3.50	2.10	73.82
Abundance, new seed	. . . 16.95	16.19	.76	10.10	68.65	1.90	2.40	77.56
" home seed	. . . 16.63	15.75	.88	8.05	68.62	4.05	2.65	77.89
American Beauty, home seed	. . . 17.37	16.19	1.18	10.10	67.07	3.13	2.33	75.03
Hamilton, local seed	. . . 17.28	16.20	1.08	5.90	71.85	2.77	2.20	73.73
Goldfinder	. . . 16.84	15.97	.87	5.50	72.61	2.55	2.50	77.05
Banner	. . . 16.95	16.20	.75	8.10	70.90	2.00	2.05	77.55
Waverley (west), home seed	. . . 15.43	14.00	1.43	10.00	69.71	2.55	2.30	76.73

INSECT ATTACKS IN 1900.

By Dr R. STEWART MACDOUGALL, Consulting Entomologist to the Society.

OF the insects concerning which inquiry has been made in the past year, four deserve full notice from their importance or their general interest or both. These are *Phyllopertha horticola*, the June Bug, the Onion Fly, the Carrot Fly, and the Wood Wasp.

THE SMALLER JUNE BUG OR BRACKEN CLOCK OR GARDEN
CHAFFER (*Phyllopertha horticola*, L.)

While at Killin in April of 1900 I received complaints of the ravages of a grub upon grass-land. From the description the pest seemed likely to be the grub of *Phyllopertha*, and on specimens being procured, this proved to be the case.

Description of Beetle.—The beetle, which in family relationship comes close to the cockchafer and the troublesome *Rhizotrogus*, the larger June bug, is about one-third of an inch long. The colour is shining greenish-black, with blackish or grey hairs. The head and thorax are glossy blue-green. The wing covers are generally yellow-brown, sometimes darker along their line of meeting and at the edges.

Description of Grub.—The grub is whitish, fleshy, and wrinkled, with a brown head and gnawing jaws. There are three pairs of short legs on the thorax, which legs can aid the grub in its movements, but the characteristic position for the grub is lying on its side. The hind end is swollen and darker in colour. Our grub and those of the cockchafer and *Rhizotrogus* are very like one another, and it is possible that the cockchafer grub gets the credit, or rather discredit, of some of the work of *Phyllopertha*. The cockchafer grub when grown is very much larger than the grub of *Phyllopertha*, but before the former has grown, when the two grubs are of the same size, they are extremely easy to confuse. Here in two parallel columns are the easiest marks of distinction between the two, a good lens being required for the determination:—

Cockchafer Grub.

The third joint of the antennæ one-third shorter than the first joint.

Of the three pairs of legs the claws of the front pair are longer than those of the second pair, and

Phyllopertha Grub.

The third joint of the antennæ the same length as the first joint.

Of the three pairs of legs the claws of the front pair are shorter than those of the second pair, and

Cockchafer Grub.

those of the second pair longer than those of the third pair.

The thigh (femur) one-quarter longer than the shin (tibia).

Phyllopertha Grub.

those of the second pair shorter than those of the third pair.

The thigh (femur) twice as long as the shin (tibia).

The grub of *Phyllopertha* is the "cockerbundy" of the angler, who knows its value as bait.

Life-history.—The beetles are found flying about in June and July, in some years in perfect swarms. I remember them in June some years ago being a perfect nuisance at a tennis tournament, landing on players and spectators alike. Mr Campbell of Tullich wrote me this year from near Killin to say that from the middle of June to the end of July on sunny days they were swarming on the face of the knolls. This love of sunshine is characteristic; they are then very active, whereas in the morning and late in the day they are sluggish and can be caught easily.

The adult beetle does harm by eating the leaves of forest trees like the oak, or more commonly the leaves of orchard trees like the apple, pear, and plum. There are records of such trees having been quite defoliated by *Phyllopertha*. Roses suffer greatly, both leaves and flowers being destroyed. Fruits are also attacked: I have in my collection a number of young apples with pieces gnawed out by the beetles, and other rosaceous fruits are equally harmed.

The females lay their eggs in garden soil and plentifully in grass-land, and the grubs from the eggs spoil the plants by gnawing their roots—the roots of grass, clover, cabbages, garden-flower plants, and even young spruce plants.

In the infestation near Killin it was chiefly grass and clover which suffered, the roots being bitten through and the plants of course withering. I quote the following from Mr Campbell's letter: "We have the grubs here on old leas and natural dry knolls, and recognise their presence by the colour of the grass and by the working of the birds as they peck and scrape up the fog in searching for the grubs. The damage done is very considerable, especially on old lea-lands that are often hay-cropped. Cattle walking over infested patches in wet weather will sink two and three inches in the soil and make a mess of the land in a short time." And again, "I find them in dry sloping ground, and as a result of their work the soil is as soft and fine under one's feet as if it had been harrowed, only a few of the deeper-rooted grasses keeping their hold."

I brought some of the grubs from Killin with me to Edinburgh on April 11. These grubs were got with greater difficulty and at greater depth than would have been the case in the

summer; in the cold of winter (and snow was lying on the higher ground at Killin in April of this year) the grubs go deeper for protection. I kept these grubs in a jar in some soil in my room, and by April 19 a number of them had become pupæ, the white pupa showing through the last moulted larval skin. On May 14 the first perfect beetle emerged.

In working against this pest most good will be done by catching and destroying the beetles before they have laid their eggs. In the early morning the trees and plants upon which these beetles collect should be shaken, and the falling beetles (and in a swarm year they may be caught in showers) caught on cloths spread for the purpose or in an inverted open umbrella, or, on lower plants, in vessels. Dropped into boiling water, the beetles will be immediately killed, or the bucket or other vessel into which the caught beetles are thrown should contain a little paraffin.

The grubs, unfortunately, are difficult to reach, but 3 or 4 tons of gas-lime to the acre would be the likeliest remedy on grass-land infested with the grubs.

Crows gorge themselves on the grubs, as also do pheasants, starlings, and thrushes, while the common hen takes them readily if it gets the chance.

THE ONION FLY (*Anthomya* or *Phorbia ceparum*).

This fly, whose maggots are so pestiferous to the onion crop, measures one-quarter to a third of an inch in length. The colour is grey, the males being distinguished by their having a dark line down their back; the eyes of the male, too, are closer together than they are in the female, a sexual distinction which is very common among the Diptera. The abdomen of the female is somewhat more pointed. The iridescent wings have yellow-brown veins.

The maggots, which are the direct cause of the harm, are legless, smooth, and fleshy, with a pointed head provided with two rasping hooks and a blunt posterior end, in the centre of which are two brown spiracles (the openings of breathing tubes), while round the margin of the hind segment are a number of little projections.

The pupa-case is oval and reddish-brown, and shows the terminal projections also.

Life-history.—In April or May the flies issue from the pupa-cases, which have passed the winter in the soil (it seems probable that on occasion the winter is passed in the adult condition, the flies remaining in shelter until the entry of favourable weather conditions), and the females proceed to lay their oval white eggs close to the leaves above the surface of the ground.

The maggots on hatching descend between the leaves into the bulb, which by their gnawing becomes rotten.

The full-fed maggot becomes a pupa inside the brown case, generally in the soil, but sometimes in the rotten bulb, and in a fortnight or so in the summer-time the next generation of flies issues from the pupa-cases. The length of the cycle or round of life varies according to the weather conditions, but it seems likely that from egg-laying till the appearance of the next brood of flies may be reckoned on the average as taking about five weeks. Thus there may be several generations in the season. Of course the intervention of winter renders the life-cycle of the last brood of the year much longer.

The attacked plants can be recognised by their leaves becoming soft to the feel and bending over and changing to a yellow colour. On being gently pulled they come away easily.

How to fight the Pest.

Preventive.—On a small scale the following would be likely to meet with success: Take a pailful of dry sand and mix with it a cupful of paraffin-oil. Place a little of this at the base of the onion plants or work the whole into the soil. The flies will not lay their eggs under such conditions, or if some eggs be laid and hatch, the young maggots will be killed if they come in contact with the paraffin. Professor Slingerland in a report in 1894 chronicles the success of this method of treatment against the Radish Fly, a similar pest, "the sand saturated with paraffin being sprinkled along the rows once a-week until the radishes were large enough to thin out and have the ground well hoed over the roots."

The spraying as recommended in connection with the Carrot Fly (see later) could also be practised here.

Remedial.—All infested plants should be carefully removed when these are noticed to be affected, and destroyed before the maggots have had time to develop themselves.

In New Jersey, where the onion crop is an important one, and where our pest is also very troublesome, Professor Smith reports the "uniform success" of the following plan: "Keep a close look out for the first sign of the maggots. Turn away the earth from the rows with a hand-plough so as to expose the root system in part, then apply broadcast about 600 lb. of kainit and 200 lb. of nitrate of soda per acre; turn back the earth to the plants, and this will put a stop to the injury. The application is best made just before or during a rain, or immediately after a good shower. The object is to get the salty fertilisers dissolved rapidly and brought into direct contact with the roots of the plant, and, of course, with the insects as well. This plan

has proved entirely satisfactory on light lands, but it has never been tested on heavy land."

THE CARROT FLY (*Psila rosæ*, Fab.)

This is a smaller fly than the last, measuring a fifth of an inch in length, and less than an inch in spread of wings, which are iridescent and have yellowish-brown veins. The colour of the body is black or dark green, the head and legs being yellow.

The maggot is whitish yellow, legless, smooth, and with a pointed head. At the head end are two curved hooks used in feeding; the hind end is blunt and has two small black spiracular plates.

The pupa-case is light brown and wrinkled, and there are the two black spots at the posterior end.

Life-history.—The first brood of flies issues in spring from pupa-cases which have lain over winter in the soil. The eggs are laid on the carrots a little below the surface of the ground. The maggots from these eggs bore into the root, making, especially in the under parts, winding tunnels, which get filled with excrement, and soon the rotting which follows attack is accompanied by a nasty smell and—if the carrot be eaten—a disagreeable taste. The tunnels show a rusty colour. The full-fed maggot leaves the carrot and becomes a pupa in the soil.

As with the Onion Fly, the whole life-cycle is passed through rapidly, allowing for more than one generation in the year.

Measures against the Pest.

Preventive.—An excellent preventive measure, and one that I can recommend from reports made to me of its usefulness, is a spraying with paraffin as follows: Dissolve half a pound of soft soap in a gallon of boiling water. The water should be soft. Gently warm two gallons of paraffin (take care of fire), and add to it on removal from the fire the boiling soap solution. Churn thoroughly till a butter-like emulsion be formed. For use dilute with 20 gallons of water. Spray (in a garden, with a watering-can provided with a rose) the carrot-bed after sowing, again after germination, and a third time after thinning.

The above proportions would be for use on a large scale. For a small garden the proportions of soap and paraffin could be reduced, and the amount of water to dilute would also be reduced proportionately.

Remedial.—Remove from the ground carrots seen to be attacked (the withering and yellow colour of the leaves will be a guide). But this removal of the plants should be done

carefully and thoroughly and in good time. The careless wounding of the roots as these are drawn out may be a means of promoting attack, as the odour from the wounded carrots gets into the air and acts as a guide and an attraction to the carrot flies, whose sense of smell (like that of insects in general) is acute. This also is why the pest is worst at thinning-time, as thinning means a good deal of bruising of the plants. One should thin early or thin late, and after thinning leave the soil well compacted, so as to make it difficult for the fly to reach the roots for its egg-laying.

Where there has been a previous infestation of the maggot a dressing of gas-lime—4 tons to the acre—should be applied on removal of the crop. A turning up of the soil in the winter-time would expose any over-wintering pupæ; while the burying of the surface soil would leave any pupæ that might be present at such a depth that even if the pupa-cases gave out their flies, these could not make their way above ground.

THE SIRICIDÆ OR WOOD WASPS.

Wood wasps are among the largest and most striking of the Hymenoptera, the order that includes bees, wasps, ants, and sawflies. There are two species of importance in our country—viz., *Sirex gigas*, the giant wood wasp, which attacks spruce, silver fir, larch, and rarely pine; and *Sirex juvencus*, the steel-blue wood wasp, which lays chiefly in pine, but also in larch. Every year for the last three or four, and again this year, specimens of both of the Sirices have been sent to me with requests for information.

Sirex gigas.—Female may reach a length of $1\frac{1}{2}$ inch, but is often smaller, specimens having been taken as small as a little over half an inch. The head and body are black except the first two and the last three segments of the abdomen, which are yellow. The abdomen ends in a spine, below which is the conspicuous projecting ovipositor or egg-laying tube (fig 82), consisting of a boring apparatus enclosed in two horny side sheaths. The male is smaller, and has the rings of the abdomen reddish yellow, except the first and the last, which are black.



Fig 82.—End of abdomen of *Sirex gigas*, female, showing spine and ovipositor. (Natural size, original.)

Sirex juvencus.—While in this insect, as in the former, there are variations in colour, the female (fig. 83) is typically blue, with reddish legs; while the smaller male (fig. 84) has rings four to seven of the abdomen yellowish. The size varies from $\frac{1}{2}$ inch to $1\frac{1}{2}$ inch, and the spread of wings from $\frac{3}{4}$ inch to

2 inches. Specimens which I bred out of a pine gave the following measurements: males, $\frac{3}{4}$ inch, $\frac{7}{8}$ inch, 1 inch, $1\frac{1}{8}$ inch; female, $1\frac{3}{8}$ inch.

Some hold that *S. juvenus* may be neglected in our country as it is not a British insect, but there is no doubt whatever that *juvenus* breeds with us and so cannot be neglected. I have records in my notes of its capture in the following places: Glamorgan, Innerleithen, Cramond, Roslin, Aberdeen, Ayr, Galway; and in September of this year a number were sent

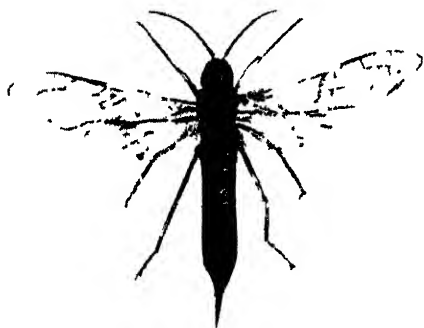


Fig 83.—*Female of Sirex juvenus.*
(Natural size, original.)



Fig 84.—*Male of Sirex juvenus.*
(Natural size, original.)

to me from a smithy in Lockerbie. The floor of the smithy was made of pine-wood that had been blown down in the winter of 1896 and had been left lying for some time. The timber was cut in February 1898 and laid in the floor in November 1898. The wood had contained the grubs of the steel-blue wood wasp, for in July 1899 there issued a number of the wood wasps, which attracted attention, as they flew about the smithy, by their size and their buzzing noise. In September of this year there was further issue from the floor.

Life-history of the Sirex Species.—The female by her long and strong ovipositor bores a hole through the bark into the youngest wood of sickly standing trees or blown or felled timber. This it does very quickly. Mr Mitchell, Lord Dunraven's forester, has described to me in a letter his observations of the oviposition of *juvenus*: "On closely examining the bark, or, still better, the timber under the bark, the holes made by the ovipositor are easily found. They are usually single or in groups of two or three, and have a small raised collar round them, the result of the accumulation of bore-dust between the bark and the wood. They are sometimes as much as half an inch deep, including one-eighth of an inch of bark. The usual depth for the most successful hatching is about one-

quarter of an inch or slightly over—*i.e.*, as deep as the second or third layer of wood. The wood wasp about to deposit first wanders all over the log, the point of the ovipositor and its sheath dragging against the bark and the antennæ working vigorously until a suitable place is found. The actual operation of boring takes about four minutes. When the borer is full down there is a halt for a moment and a heaving sort of movement, during which presumably the egg is passed. The insect in six or seven days makes from a hundred to about one hundred and fifty borings."

At each boring one egg is laid, from which comes a whitish grub (fig. 85), which, when full grown, measures over an inch in length. It is round and has three pairs of very small thoracic feet, and strong biting jaws. A spine projecting from the last segment is also characteristic.



Fig 85.—Grub of *S. juvenis*
(Original)

The hatched-out grub, after following the same layer of wood from about three-eighths to three-quarters of an inch, increasing rapidly in bulk meanwhile, then turns inwards towards the centre of the tree, and later on curves out again towards the surface so as not to leave too great a thickness of wood to be bored through by the mature insect when it is ready to issue.

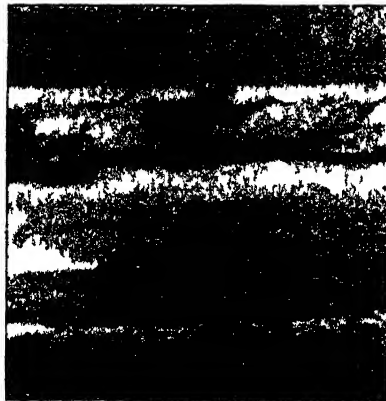


Fig 86 — *Sirex juvenis* in the act of cutting its way out of a pine stem after pupation (Natural size, original)

As the larva progresses the part of the tunnel behind is filled with bore-meal. When full fed the grub pupates in a chamber at the end of its tunnel, and when the wood wasp is fully

developed it gnaws the circular hole by which it emerges (figs. 86 and 87).



Fig. 87.—Pine stem showing flight-holes of *Sirex juvenis*. (Natural size, original.)

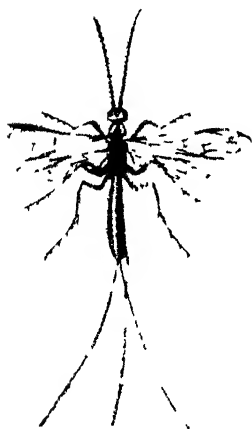


Fig. 88.—*Rhysda persuasoria*.
(Natural size, original.)

The flight-time of the adults is from July on to August and September. In 1898 from a piece of pine I bred out several *juvenis* in July and August. In 1899 from 4 feet of pine stem my first *juvenis* issued on August 8. By August 15 thirteen adults had issued, and this issue continued at intervals till September 21. There is a lack of experimental evidence as to the length of time elapsing from the egg-laying till the appearance of the adult insect. It seems certain, however, that the generation is never less than two years, and it certainly is often longer.

Preventive and remedial measures.

—For egg-laying sickly grown trees are chosen, or such as have been accidentally wounded. These should be felled and removed. Attacked stems are often rendered quite useless for technical purposes,

the wood being honeycombed with larval galleries. Trees felled and barked and allowed to lie are also used as breeding-places.

A parasitic enemy of *juvencus* is the Ichneumon Fly (*Rhyssa persuasoria*, fig. 88). This large and handsome hymenopterous insect was sent to me two years ago from Glamorgan, where it was found laying its eggs in a piece of larch that contained grubs of the steel-blue wood wasp. *Rhyssa* by means of a long ovipositor bores into a tree where the wood wasp grubs are at work and lays an egg in the gallery gnawed by the wood wasp. When the *Rhyssa* grub hatches out it proceeds to feed on the grub of the wood wasp, which is thus destroyed. The ovipositor of *Rhyssa* is very long, and sometimes this ichneumon is captured fixed to the tree by means of the ovipositor, which it has been unable to withdraw after boring.

THE CEREAL AND OTHER CROPS OF SCOTLAND FOR 1900, AND METEOROLOGY OF THE YEAR RELATIVE THERETO.

THE CROPS.

THE following comparison of the cereal and other crops of 1900 with those of the previous year has been prepared by the Secretary of the Society from answers to queries sent to leading agriculturists in different parts of the country.

The meteorology of the year has been furnished by Dr Alex. Buchan, Secretary of the Meteorological Society of Scotland.

The queries issued by the Secretary were in the following terms:—

1. What was the quantity, per imperial acre, and quality of grain and straw, as compared with last year, of the following crops? The quantity of each crop to be stated in bushels. What quantity of seed is generally sown per acre?—(1) Wheat, (2) Barley, (3) Oats.
2. Did the harvest begin at the usual time, or did it begin before or after the usual time? and if so, how long?
3. What was the quantity, per imperial acre, and quality of the hay crop, as compared with last year, both as regards ryegrass and clover respectively? The quantity to be stated in tons and cwts.
4. Was the meadow-hay crop more or less productive than last year?

5. What was the yield of the potato crop, per imperial acre, as compared with last year? The quantity to be stated in tons and cwts. Was there any disease? and if so, to what extent, and when did it commence? Were any new varieties planted, and with what result?
6. What was the weight of the turnip crop, per imperial acre, and the quality, as compared with last year? The weight of the turnip crop to be stated in tons and cwts. How did the crop braid? Was more than one sowing required? and why?
7. Were the crops injured by insects? State the kinds of insects. Was the damage greater or less than usual?
8. Were the crops injured by weeds? State the kinds of weeds. Was the damage greater or less than usual?
9. Were the pastures during the season of average growth and quality with last year?
10. How did stock thrive on them?
11. Have cattle and sheep been free from disease?
12. What was the quality of the clip of wool, and was it over or under the average?

From the answers received, the following notes and statistics have been compiled:—

EDINBURGSHIRE. *Wheat*.—36 to 40 bushels; crop not so good as last year; quality inferior; straw about the same; 3 bushels seed sown.

Barley.—40 to 44 bushels; quality inferior to last year; straw about the same; 3 bushels seed sown.

Oats.—48 bushels or so; quality very fair where well harvested; straw about the same as last year; 4 bushels sown.

Harvest began about the same time as last year. Weather very good in September for taking in the crop.

Hay.—First crop about the same as last year; quality better, about 2 tons 10 cwt. Second crop very good, but very ill secured. *Meadow-hay*—Much about the same as last year. Very well secured.

Potatoes.—Better than last year; 6 to 7 tons, and less disease than last year.

Turnips.—Better than last year; about 25 to 30 tons. The crop braided well; scarcely any second sowing, and not injured by fly. *Mangold*.—Better than last year; about 20 tons.

No damage by insects or weeds.

Live Stock.—Pastures, great growth, quality scarcely so good with so much rain. Stock healthy and quite free from disease. Both cattle and sheep thrive well. *Clip of wool*.—About the same; prices very low.

LINLITHGOWSHIRE (East and North Districts). *Wheat*.—Not so good in quantity and quality as last year; from 30 to 36 bushels; seed from 2½ to 3 bushels.

Barley.—Better in quantity and quality than last year; from 30 to 40 bushels; seed from 2½ to 3 bushels.

Oats.—Better in quantity and quality than last year; from 30 to 40 bushels; seed from 4 to 5 bushels.

Harvest began and ended about the usual time in the east and north

part of the county. In the south part about a month later in beginning and two months in ending. For the south district of the county it will be the worst harvest in living memory, on account of bad weather.

Hay.—Better in quantity and quality than last year from 1 to 2½ tons.
Meadow-hay.—Very little grown.

Potatoes.—A little better than last year; from 4 to 8 tons. A good deal of disease in the early kinds.

Turnips.—Much better than last year; from 20 to 30 tons. Very little second sowing.

No injury by insects or weeds.

Live Stock.—Pastures of average growth and quality. Stock thrive well. Cattle and sheep free from disease. *Clip of wool*.—Average

HADDINGTONSHIRE (Upper District). *Wheat*.—None grown.

Barley.—26 bushels; quantity and quality of straw and grain very deficient; 3 bushels sown.

Oats.—37 bushels; fair quality; good crop of straw; 4 bushels sown.

Harvest began same date as last year.

Hay.—2 tons; good quality when well got. *Meadow-hay*.—Short crop.

Potatoes.—5 tons; no disease; no new varieties planted.

Turnips.—20 tons of good quality; good braird, and no resowing necessary.

No injury done by insects or weeds.

Live Stock.—Pastures average. Stock did well. Cattle and sheep free from disease. *Clip of wool*.—Average.

HADDINGTONSHIRE (Lower District). *Wheat*.—From 40 to 48 bushels; rather less straw than last year; 3½ to 4 bushels sown.

Barley.—From 40 to 48 bushels; rather less straw than last year; 2½ bushels sown.

Oats.—40 to 44 bushels; less straw than last year; 4 bushels sown.

Harvest began on 15th August, or about the same time as last year. Grain all very much damaged by the wet weather. There has not been such bad harvest weather for many years.

Hay.—About 2 tons first crop; well got. A good deal of second crop spoilt by the wet weather. *Meadow-hay*.—None grown.

Potatoes.—About the same as last year. Main crops 4 tons; up-to-date 7 to 8 tons; very little disease. Earlier sorts a fair crop; not very many grown.

Turnips.—Did not braird well; very little second sowing. On account of the open back end they finished a very big crop in the most of cases.

Greater damage than usual by insects. No injury by weeds.

Live Stock.—Pastures rather bare at beginning of season; latterly abundance of grass. Stock did fairly well, but the weather was too wet for them. Cattle and sheep free from disease. *Clip of wool*.—About an average.

BERWICKSHIRE. *Wheat*.—32 bushels. Quantity and quality both deficient as compared with last year, the result of the cold spring and want of sunshine. Seed sown, 3½ bushels.

Barley.—28 bushels. 20 per cent less straw than last year. The above remarks apply also to the barley crop. The grain was much deteriorated by wet weather during harvest. Seed sown, 3 bushels.

Oats.—30 bushels. Above remarks also apply to the oat crop, which was thin on the ground and below average quality. Seed sown, 4 bushels.

Harvest began about the usual time in the lower districts—viz., the middle of August—the higher districts ten days to a fortnight later, and

was very prolonged owing to broken weather, till the latter end of October—an exceptionally wet month.

Hay.—25 to 30 cwt.; quality middling, and partly damaged by rain. *Meadow-hay*—Under an average.

Potatoes.—3 tons, or 40 per cent under an average. Growth early checked and tubers exceptionally small. Disease prevalent.

Turnips.—15 to 18 tons. Quantity and quality 20 to 25 per cent above last year, even more in many cases; but the average is reduced by the prevalence of finger-and-toe to an unusual extent. Braided well. Less sowing over than usual.

Turnip-fly. Damage not greater than usual. Thistles prevalent, also wild mustard, which in some cases was successfully destroyed by spraying with sulphate of copper.

Live Stock.—Pastures under an average owing to cold spring and summer. Seeds of the grain crop exceptionally good. Stock did fairly well. Lambs better in condition than last year. No epidemic. Generally free from disease. *Clip of wool*—Average.

ROXBURGHSHIRE. *Wheat*.—About 28 bushels; quality not so good as last year.

Barley.—About 27 bushels; quality inferior.

Oats.—About 33 bushels; average quantity; considerably more straw than last year.

Harvest began at the usual time.

Hay.—About 1½ ton; various qualities. *Meadow-hay*—A full crop, but a good deal of it badly got.

Potatoes.—A very small crop, and quality inferior; not more than 2½ tons of marketable potatoes.

Turnips.—A much better crop than last year, fully 20 tons. Swedes the best of the season. Almost no second sowing.

No destruction by insects. Very little damage by weeds.

Live Stock.—Pastures good the whole season. Stock did well. Little or no disease. *Clip of wool*—Rather under the average.

SELKIRKSHIRE. *Wheat*.—None grown in the district.

Barley.—30 bushels; not so good as last year; seed sown, about 4 bushels.

Oats.—34 bushels; not so good as last year. A great deal of grain stacked in bad condition. Seed, about 5 bushels sown.

Harvest about eight days later.

Hay.—Quantity much greater, and quality very different from last year. It would be very difficult to state the weight per acre, the land varies so much. Average, say 2 tons. *Meadow-hay*—Much more productive, but quality very inferior, and very expensive to get.

Potatoes.—About the half of last year; very little disease. No new varieties planted. I could not even venture to name an average weight.

Turnips.—Crop very various. Some very good, others very inferior. Good deal of finger-and-toe. Quality good when sound, say 15 tons 10 cwt.

No injury by insects. No damage by weeds.

Live Stock.—Pastures much more than average growth. I never remember such a grassy year. Doubtless the quality would not be so good. Too much rain. Stock thrived well. Cattle and sheep free from disease. *Clip of wool*—Under average, in which case it would be a little deficient in quality.

PEEBLES SHIRE. *Wheat*.—None grown.

Barley.—None grown.

Oats.—Average crop, 36 bushels; straw, 30 cwt.; quality good; 5 bushels seed sown.

Harvest began at the usual time.

Hay.—Heavy crop, 2 tons. Clover scarce; quality good. *Meadow-hay*—Average crop.

Potatoes.—Under average, with a little disease. Commencing in September. No new varieties.

Turnips.—Average crop, 20 tons; braided well; no resowing.

No insects. No weeds.

Live Stock.—Pasture abundant. Stock thrive well. Cattle and sheep free from disease. *Clip of wool*—Under average, accounted for by late spring.

DUMFRIESSHIRE (Annandale). *Wheat*.—None grown.

Barley.—Very little barley grown in district, and nearly all damaged by bad weather. Bulk same as last year; 3 to 4 bushels sown.

Oats.—I have been unable to ascertain what the oat crop is likely to yield, as, owing to this unusually mild weather, farmers have thrashed very little grain, and any one I spoke to was not in a position to state definitely what the crop would yield. All expect that owing to crops lodging early the yield will be less than last year (straw more). Seed sown, 3 to 4 bushels drilled; 4 to 6 broadcast.

Harvest began last week in August (usual time).

Hay.—Crop unusually heavy owing to superabundance of clover. 2 tons would be the average for district. In many cases farmers state that they secured 3 tons. *Meadow-hay*—Meadows would compare with last year.

Potatoes.—4 tons would be an average for the district, or less than one-half of last year's crop. Potatoes promised unusually well up till middle of July, after that they made nothing. Wet season the cause of failure of crop.

Turnips.—Weight of crop more and quality better than last year. Average (leaving out fields badly infested with finger-and-toe), 28 tons. Crop braided well; no second sowing required. Swedes better than yellow turnips, as autumn and early winter were unusually favourable to growth. Weather mild, little or no frost.

All crops were free from insects. Some damage to Swedes, causing second growth and rotting near top. Crops were not much injured by weeds, although, owing to wet season, the weeds were difficult to keep under.

Live Stock.—Pastures were of more than average growth, but quality was deficient owing to wet weather. Young stock seemed to do well. Old feeding cattle might have done better. A good many farmers complained of abortion among cows. Foot-rot was prevalent among sheep, owing to rough state of fields and to wet. There have been very few deaths among sheep on turnips (braxy). Last year the death-rate from this cause was unusually high. *Clip of wool*—Quality good; quantity slightly under average.

DUMFRIESSHIRE (Eskdale). *Wheat*.—None grown.

Barley.—Very little, if any, grown—practically none.

Oats.—35 bushels; 5 bushels sown. Quality of grain good where well got; straw abundant, but awfully twisted by high winds accompanied by very heavy rains, this being general and causing immense trouble and expense in the cutting. In a great many instances the reaping-machine had to be discarded; but fortunately a short spell of good weather set in which enabled the bulk of the crop to be cut and gathered in good condition.

Harvest began about the usual average time, but nearly a fortnight later than the previous year.

Hay.—Ryegrass and clover hay a heavy crop, and, as a rule, well got, consequently good quality; about 30 cwt. on an average. Some very heavy crops contributing to this. Prices ruled low, about 3s. 2d. per imperial stone taken from the pike and delivered free to the buyer. Clover unusually luxuriant. *Meadow-hay*, a very heavy crop and of good quality where cut, and secured in the end of July and latter end of September; otherwise a large quantity almost completely wasted by rain—many meadows in upland districts being actually left uncut, and in several cases, where late in cutting, absolutely left in cock, and in other instances left to rot in the swathes, as rain fell nearly every day.

Potatoes.—A poor, miserable crop, perhaps the worst on record. It is scarcely possible to estimate yield, but it is safe to say that there was less than half a crop; in many cases very little more was produced than a ton to the acre. Disease was very prevalent, commencing about the middle of August, some varieties being much worse than others, Bruces perhaps the worst to the extent probably of a quarter of the crop; Up-to-Date were little diseased and a much heavier crop than any other variety, just the reverse of what they were the previous year. All varieties were small in size. No new varieties planted.

Turnips.—Turnip crop very much superior to last year, both in quantity and quality. Some exceptional crops will bulk up to 40 tons, the general average will be nearly 25 tons; nearly all sound and healthy, and in consequence stand a lot of eating; but stock, where confined on the turnips, have been in a miserable plight owing to the unprecedented rainfall. Albeit on dry well-drained lands they have been, and still are, growing where still unpitted. The crop braided well, and very little resowing required.

Little injury to crops by insects, and damage less than usual. Crops, where put in on land laid down in a dirty state, were very full of weeds of all descriptions, thistles being very prevalent, and charlock on many fields assumed a golden appearance; but where enterprising tenants used the sprayer they were quite destroyed, the crops after a fortnight acquiring a dark green hue, testifying how beneficial the dressing was, independently of its virtue as a destroyer of the pest.

Live Stock.—Pastures during the season were exceptionally good, and even quite green, yet with abundance of keep; but stock, especially sheep, have, from the excessive downpour of rain, been sadly dashed, and hoggis grazed upon the hills are getting lean in consequence. Stock, as a rule, thrive well on the pastures; but from the soft grass, occasioned by the extreme wet season, they did not take on flesh so rapidly as they otherwise would have done. Less disease than usual, both in cattle and sheep, and little abortion amongst cows. *Clip of wool*.—A little over the average both in quality and quantity, and miserably low prices rule for it.

KIRKCUDBRIGHTSHIRE. *Wheat*.—The wheat crop was over an average, but the extent grown in the county is now limited. Yield about 33 bushels; straw fully an average; seed sown, 2½ to 3 bushels.

Barley.—Yield about 31 bushels; quality not so good as average. The season was too wet for satisfactory yield. Straw fully average. Seed sown, 3 to 4 bushels.

Oats.—Oats, 30 to 33 bushels; quality under average. A large proportion of light grain owing to crop being much laid with rain and lack of sunshine. Straw abundant, and fair quality; seed sown, 4 to 5 bushels.

Harvest rather later than usual, about ten days.

Hay.—Abundant, 30 to 35 cwt.; quality under average. *Meadow-hay*—Better than last year; quality under average.

Potatoes.—Much less than average, 3½ to 5 tons; several varieties

diseased; about end of September. Reliance, results very good; crop sound.

Turnips.—About 17 to 18 tons; much better than last year; braided well; very little resowing.

Not much injured by insects, but swedes suffered from a fungus disease (*Sphaerelle tabifica*) which has appeared more or less in recent years. Not much injury by weeds.

Live Stock.—Pastures abundant growth, but quality very poor, being too wet, with too little sunshine. Cattle throve fairly; sheep poorly; both free from disease. *Clip of wool*.—Similar to last year—an average in quality and quantity.

WIGTOWNSHIRE. *Wheat*.—26 bushels; quality inferior; seed sown, $2\frac{1}{2}$ to 3 bushels.

Barley.—30 bushels; quality not up to average; straw abundant; colour injured by heavy rainfall in harvest; seed sown, $3\frac{1}{2}$ bushels.

Oats.—32 bushels; quality fair; yield not so good as last year; seed sown, 4 to 5 bushels.

Harvest began about the usual time.

Hay.—1 ton 15 cwt.; quality good where early secured, but the bulk suffered much injury from continuous heavy rains. *Meadow-hay*.—More abundant than last year.

Potatoes.—About 2 tons. Crop nearly a failure. Disease began about same time as last year, but to a less extent. No new varieties planted.

Turnips.—19 tons. Much better crop than last year. Braided fairly well, and little second sowing required.

Not much. Fly. In some cases, where labour was scarce, there was a great growth of weeds. In damp land, after harvest began, Redshank got up very much.

Live Stock.—Pastures more than average for growth, but quality not so good as last year. Stock did not thrive so well as in ordinary years owing to too much rain and ground being always damp. Cattle and sheep free from disease. *Clip of wool*.—Considerably under average; quality much the same as in former years.

AYRSHIRE. *Wheat*.—None grown.

Barley.—40 bushels; seed sown, 3 bushels.

Oats.—40 bushels; seed sown, $4\frac{1}{2}$ bushels.

Harvest began at usual time, about 20th August.

Hay.—30 cwt.; quality good. *Meadow-hay*.—About average, 1 ton.

Potatoes.—6 tons; 5 per cent diseased; about the middle of August. Nothing very new in quantity.

Turnips.—20 tons; quality good; braided well; little resowing.

Less damage than usual from insects. Usual weeds, annuals, and to an average extent.

Live Stock.—Pastures about an average. Stock throve moderately well till late in autumn, when rainfall was too heavy. Cattle and sheep free from disease. *Clip of wool*.—About an average; $5\frac{1}{2}$ to 6 lb. per sheep on arable land.

BUTE. *Wheat*.—No wheat in Bute.

Barley.— $3\frac{1}{2}$ bushels sown; good crop, well got; straw above average grain; seed sown, 38 bushels.

Oats.—5 bushels sown; average crop; grain deficient in quality; seed sown, 36 bushels; straw above average.

Harvest began latter end of August, but 1st September general. The great bulk got in in good order; the late crop very much damaged.

Hay.—An average crop; 2 tons. *Meadow-hay*.—Little grown here.

Potatoes.—Early planted potatoes started in boxes, a very fine crop; those dug before 1st September about 7 tons; the late varieties 4 tons; not much disease; no new varieties. Commenced to dig 20th June.

Turnips.—In south end of Bute, average; except one farm, went clean away with finger-and-toe. In north end the half of the crop went with finger-and-toe; a good deal of resowing; weeds very troublesome to keep down.

Except turnips no damage by insects. The usual soft weeds on turnips and late potatoes on account of the wet weather.

Live Stock.—Pasture was good. All classes of stock did well on grass. No disease. *Clip of wool*.—About an average; very low prices.

ARRAN. *Wheat*.—None grown in the island.

Barley.—None grown.

Oats.—A fair crop; lea above average; sown down land short of straw; got secured in fair condition; yielding 30 bushels; seed sown, 6 bushels.

Harvest began about the same time as last year.

Hay.—Under average, say about 20 cwt. got; bad weather for securing. *Meadow hay*.—Above average; well secured; little grown.

Potatoes.—Early potatoes good crop, yielding 6 to 7 tons; late poor crop, bad with disease, and very small; not more than 3 tons fit for market.

Turnips.—Better than last year, but a good deal of finger-and-toe; about 15 tons.

Not more than usual injury by insects. Not more than usual damage by weeds.

Live Stock.—Plenty of grass, quality below average in autumn. Stock did fairly well. No disease in cattle; sheep bad with foot-rot. *Clip of wool*.—Light, much under average; prices very poor.

LANARKSHIRE (Upper Ward). *Wheat*.—None grown.

Barley.—None grown.

Oats.—About 30 to 35 bushels; quantity about the same as last year. Quality good where got early, but a portion of the crop, which was late in being secured, was a good deal damaged by weather; seed sown, 5 to 6 bushels.

Harvest began about the usual time, in the end of August and beginning of September.

Hay.— $2\frac{1}{2}$ to $2\frac{3}{4}$ tons, being a little better than last year. Quality good where well got. Aftermath good. *Meadow hay*.—Fully better than last year, but greater waste in securing.

Potatoes.—A variable crop. In some districts the yield was fully better than last year, in others less. Average may be stated about 6 tons. A little disease commenced about the middle of August. The latest varieties are British Queens and Scottish Triumph, which have shown good results. Much difficulty was experienced in lifting the crop owing to the excessive rain.

Turnips.—26 or 27 tons; much better than last year; quality good; very little resowing.

Not more than usual injury by insects. Not more than usual damage by weeds, although, owing to wet season, they gave a little more trouble in dealing with them.

Live Stock.—Pastures fully average growth, but quality not so good. Stock thrived well, especially in the beginning of the season. Cattle and sheep free from disease. Less deaths than usual among sheep. *Clip of wool*.—Quantity and quality up to average, but prices exceedingly low.

LANARKSHIRE (Upper Ward). *Wheat*.—40 bushels; quality of grain and straw good; heavy crop, but very badly laid and difficult to cut; seed sown, $3\frac{1}{2}$ bushels.

Barley.—Hardly any grown.

Oats.—35 to 40 bushels; heavy crop of straw, but very sorely laid and very difficult to harvest. Wet harvest spoiled most of grain in later districts, and is of little value except for feeding.

Harvest began at usual time; fine until end of September, but after that the wettest on record.

Hay.—Larger crop than last year; ryegrass about 2 tons; timothy 2 to 3 tons; very fairly secured. *Meadow-hay*.—Average, but less fortunate for weather.

Potatoes.—7 to 8 tons. Early varieties bad with disease. Up-to-Dates, Scottish Triumph, and British Queen comparatively clear of disease. Very wet weather for harvesting.

Turnips.—Fair crop; braided well, but latterly got too much rain and sickened crop. Yellows, 20 to 25 tons; swedes, 25 to 30 tons.

No injury by insects or weeds. Weeds more difficult to kill, but no injury.

Live Stock.—Pastures good and plentiful. Stock thrive well. No disease. *Clip of wool*.—Average.

LANARKSHIRE (Lower Ward). *Wheat*.—40 bushels; just about an average of straw both in quantity and quality; seed sown, 4 bushels.

Barley.—None grown.

Oats.—40 bushels; a bulky crop of straw; in a lot of cases it was too heavy to be good; seed sown, 5 bushels.

Harvest started about 25th August. The first of it very good, and the latter stage very tedious; difficult to get it secured.

Hay.—Ryegrass hay 2 tons, and in some cases more, but a lot of it spoiled owing to wet weather. *Meadow-hay*.—Better than last year.

Potatoes.—A very irregular crop; average 5 tons. A lot of disease in some kinds. Very few new kinds planted in this district.

Turnips.—A good crop; an average of from 15 to 20 tons; braided very well, but some finger-and-toe.

No injury by insects or weeds.

Live Stock.—Pasture good everywhere. Stock thrive on them and were free from disease.

RENFREWSHIRE. Unlike the preceding year of 1899, when spring and seed-time were so unfavourable for germinating requirements, that of 1900 was one of the finest seed-times that has been experienced for many years; indeed in this respect the spring of 1900 was a record. March was an unusually dry month, the rainfall being only 0.30, while April and May were moderate, having an average of 4.71, and the two following months 3.78, the climatic conditions therefore were so far favourable for securing good crops; in so far as bulk was concerned this result was realised, but they fell very far short as to quality.

The oat crop generally suffered from continual rain in August and September. In a few instances, where the crop was ready and early harvested, it was well secured, but as a rule the harvest was very protracted and the crop consequently suffered.

The ryegrass hay crop was rather better in quantity than last year, but the weather was not favourable for securing it. The meadow-hay was also a heavier crop than last year, but there was considerable difficulty in securing it, and the quality was consequently inferior.

Potatoes yielded about 5 tons. There was a good deal of disease, and the land was in a very saturated condition for lifting them. Up-to-Date

and Gartons maintain their character both as to producing a good crop and resisting disease.

Turnips braided well, there was no second sowing, and yielded from 25 to 30 tons. Finger-and-toe was troublesome in some crops; and it was noticed on some lands that the turnips were injured by a rottenness arising between the shaw and the root which destroyed the bulb.

The rainfall during the year was 71·02 against 62·10 in the previous year.

ARGYLLSHIRE (District of Lochgilphead). *Wheat*.—None grown.

Barley.—None grown.

Oats.—About 36 bushels; quality much the same as last year; seed sown, 6 bushels.

Harvest began on 23rd August—about the usual time.

Hay.—About 35 cwt.; fair quality, but very difficult to secure owing to the weather. *Meadow-hay*.—More productive than last year.

Potatoes.—Yield not so good as last year; about 4 tons 10 cwt. Some parts of the district very badly diseased, which started in the 1st of September. Potatoes on peat soil almost free of disease.

Turnips.—Not quite up to last year; quality fair; weight about 20 tons; braided well; no second sowing.

No injury by insects or by weeds.

Live Stock.—Pastures above the average growth; too much rain, and quality not so good. Stock did not thrive so well in early part of the season, latterly much better. Cattle and sheep free from disease. *Clip of wool*.—Average, and of good quality.

ARGYLLSHIRE (Kintyre). *Wheat*.—None grown in the district.

Barley.—About 36 bushels; grain and straw good; much the same as last year; seed sown, about 4 bushels.

Oats.—Good on lea land, but deficient on land after green crop. Average on lea land about 40 bushels, and after green crop about 30 bushels. Straw and grain much the same as last year; seed sown, 5 bushels.

Harvest began about the usual time.

Hay.—Crop fair, about 2 tons. *Meadow-hay*.—Crop about the same as last year.

Potatoes.—Early sorts good; late kinds deficient both in quantity and quality; average about 5 tons.

Turnips.—Average about 18 or 19 tons; fair crop, fully better than last year.

No injury by insects; very little damage from weeds.

Live Stock.—Pastures very good, above the average. Stock did very well and thrive well. No infectious disease, except the usual deaths by tuberculosis. *Clip of wool*.—Fairly good, and about an average.

ARGYLLSHIRE (Islands of Islay, Jura, and Colonsay). *Wheat* and *Barley*.—None grown.

Oats.—Larger crop than average both in grain and straw. Grain heavier per bushel than has been the case for several years. Seed sown, 5 to 6 bushels.

Harvest about ten days later than usual of starting. In the earlier localities a large proportion of the crop was secured without any rain, but as a rule the harvest was most protracted, and considerable damage done.

Hay.—A fair average crop. Where cut early it was secured in good condition, but the later cut hay suffered from wet weather. *Meadow-hay*.—Good crop. Heavier than usual, but secured with difficulty.

Potatoes.—Crop below the average both in quantity and quality. In many cases more than half were diseased.

Turnips.—Good average crop. In some cases a second sowing was required, but as a rule the braird was good and withstood the attack of fly. After being thinned considerable damage was done in some fields by crows pulling up the turnips, apparently for the purpose of getting the grub which is often found adhering to the roots.

Weeds rather more troublesome than usual owing to damp weather.

Live Stock.—Pastures: growth luxuriant and stock did fairly well during summer. Cattle have not suffered much from disease, but owing to excessively wet weather sheep on low-lying ground have been even more unhealthy than they were last year, and the death-rate has been high. Braxy, the great curse of this district, does not appear to have been so bad as usual during the autumn. *Clip of wool*.—Fair average.

ARGYLLSHIRE (Inveraray District). *Wheat*.—None grown.

Barley.—None grown.

Oats.—A fairly good crop was grown; probably 28 or 30 bushels, but a large portion of grain and straw much damaged and lost from excessive rain.

Harvest began much about the usual time.

Hay.—The crop both of sown and meadow-hay was heavy. Sown crop probably 24 or 26 cwt., but not much of it was saved. *Meadow-hay*.—Heavy, from 20 to 25 cwt., in some places more; but this crop also considerably damaged.

Potatoes.—Grew well at first, but afterwards were drowned with excessive rain, and turned out a poor crop that could not be dug till late.

Turnips.—Generally a heavy crop, up to 30 tons and over, but a little finger-and-toe in some spots. They could not be kept so clear of weeds owing to wet weather.

Very little loss from insects, and no resowing. The season was miserably wet, and weeds could not be kept down.

Live Stock.—Pastures during the season quite of average growth and quality with last year. Stock thrived quite as well as usual. Cattle and sheep free from disease. *Clip of wool*.—Rather higher than usual. Sheep were lean in spring.

DUMBARTONSHIRE. *Wheat*.—36 bushels; quantity and quality of straw a fair average; seed sown, 3 bushels.

Barley.—Very little in the county.

Oats.—In the Highland districts about 20 bushels; quality in many cases spoiled by weather; seed sown, 5 bushels. In the lower districts of the county, 48 bushels; extra straw, but quality bad owing to very wet harvest.

Harvest a week later than usual.

Hay.—From 1 to 2 tons; quality not so good owing to wet season. *Meadow-hay*.—A good crop.

Potatoes.—Early crop 8 tons, late crop 4 tons. There was a good deal of disease (in some cases one-third of crop) in the late varieties. One new variety (Longworthy's) a good late one.

Turnips.—In the lower districts 20 tons; quality good; only one sowing. In the higher districts about 14 tons; a few cases of resowing owing to fly.

In some parts of the county turnip crop injured by fly. No other damage by insects reported. Some farmers report weeds troublesome on turnip ground. From other districts there are no complaints.

Live Stock.—Pastures—growth better than last year, but quality not so good owing to so much rain. Stock thrived fairly well. Cattle and

sheep free from disease. *Clip of wool*—Quality and quantity 10 per cent under average.

STIRLINGSHIRE (Western District). *Wheat*.—None sown in district.

Barley.—Little grown; under an average; 32 bushels; grain and straw somewhat discoloured by wet weather.

Oats.—About the same as last year—35 bushels.

Harvest operations commenced a few days later than last year; first ten days proved fine, and good work was done, afterwards unfavourable weather set in for a lengthened period, the consequence being a very protracted harvest. In some, and particularly the late, districts a good deal of the crop was much damaged from exposure.

Ryegrass-hay was an average crop, mixed with clover, and fairly well secured; about 30 cwts. *Meadow-hay*—A medium crop; and some much damaged from wet weather towards the end of the season.

Potatoes.—A light crop, from 3 to 5½ tons, small in size and soft in quality. Frosty nights blighted the leaves three weeks too early, which checked the growth of the tubers. No new variety planted.

Turnips.—Under an average. Wet weather through a great part of the summer stopped the growth and encouraged weeds, which were very prevalent in almost every field. No second sowing.

Little injury by insects.

Live Stock.—Pastures average growth, but soft in quality. Stock, although healthy, did not fatten so readily. The *clip of wool* was fair in quality although rather light in quantity.

STIRLINGSHIRE (Eastern District). *Wheat*—40 bushels; large crop of straw; grain middling quality; seed sown, 3 bushels.

Barley.—Yield 32 bushels; very useless straw; grain inferior sample; too ripe before harvested; seed sown, 3½ bushels.

Oats.—Yield 33 bushels; very heavy crop of straw, and grain of good quality where well secured; seed sown, 4 bushels.

Harvest late in beginning. Early harvesting well secured, but late very much spoiled.

Hay.—Average crop, some spoiled. Carse, 35 cwt.; dry-field, 30 cwt.

Meadow-hay—Big crop, pretty well got.

Potatoes.—7 tons, middling crop; a good deal of disease.

Turnips.—20 tons, big crop; brairded well; not much second sowing.

No damage by insects. Weeds—mustard very plentiful.

Live Stock—Good grazing year for dry land, but poor year for clay land pasture. Stock thrived fairly well. Cattle and sheep free from disease. *Clip of wool*—Poor; under an average.

CLACKMANNANSHIRE. *Wheat*.—46 bushels; 35 cwt. straw; very fair crop; seed sown, 3 bushels.

Barley.—40 bushels; about 25 cwt. of straw; good crop; seed sown, 3 bushels.

Oats.—36 bushels; straw, 20 cwt.; yield of grain below average; seed sown, 4½ bushels.

Harvest was a little later than usual of beginning; very wet towards the finish.

Hay.—2 tons ryegrass; timothy 2 tons 10 cwt.; very fair crop.

Potatoes.—6 tons; crop below average. Not many new varieties; good lot of disease.

Turnips were a very good crop this year; no second sowing required; average yield about 24 tons.

No damage by insects. No damage by weeds.

Live Stock.—Pastures are very good this year. Stock thrive very well. Cattle and sheep free from disease.

FIFESHIRE (Eastern District). *Wheat*.—38 bushels; better than last year; straw, 30 cwt.; seed sown, $3\frac{1}{2}$ to 4 bushels.

Barley.—38 bushels; better than last year, but under average owing to want of sunshine; quality fair; straw, 25 cwt.; seed sown, $3\frac{1}{2}$ to 4 bushels.

Oats.—40 bushels; under average owing to dry sunless summer; quality fair; straw, 25 cwt.; seed sown, 4 bushels.

Harvest began one week later than usual time.

Hay.—35 cwt.; crop under average; quality good. *Meadow-hay*—Very little grown in the district.

Potatoes.—4 tons better than last year, but still much under an average crop; very little disease. *Up-to-Dates*—a new variety—cropped well; 7 to 8 tons.

Turnips.—Better than last year; swedes, 20 tons; yellows, 16 tons. Brairded well. Very little resowing.

No damage by insects or by weeds.

Live Stock.—Pastures, average growth. Stock thrive fairly well. Cattle and sheep free from disease. *Clip of wool*—Good average quality and quantity.

FIFESHIRE (Middle District). *Wheat*.—36 bushels. Quality both of grain and straw better than last year. The bulk of crop very much greater than in former years. Seed sown, from $3\frac{1}{2}$ to 4 bushels; weight of straw 35 cwt.

Barley.—Yield of grain 34 bushels. Early fields very good as regards quality, later ones soft and inferior. Seed sown, $3\frac{1}{2}$ to 4 bushels; straw 28 cwt. Owing to the heavy showers much of the grain very much laid.

Oats.—The oat crop was the best of the cereals, and much better than the crop of the preceding year. The yield would be about 44 bushels; weight of straw 34 cwt. Seed sown, from 4 to $5\frac{1}{2}$ bushels.

Harvest may be said to have been an early one. In early districts it began about the 20th August, and in late ones about the first week of September.

Hay.—This crop was an excellent one, considerably later than last year. The quality also was good, although some of the earlier cut fields were damaged by rain. There was plenty of clover; weight about 32 cwt. *Meadow-hay*—Crop less productive.

Potatoes.—This crop was a very poor one—the smallest yield for a great number of years. Some varieties were very much diseased, and taking the crop as a whole about a fourth part will be affected. The crop will not exceed 4 tons. New sorts tried—British Queen, Scottish Triumph, and Longworthy.

Turnips.—This crop was a bumper one—the best for many years. It was sown early, and brairded quickly and thick. No resowing. There was some disease, amongst the yellows chiefly. The average weight of swedes would be fully 25 cwt. and yellows 20 cwt.

There was little or no damage by insects. I saw one field of wheat after beans a little thinned out by wireworm. The crops last season were very little injured by weeds. The frequent showers kept the crops growing and soon choked the braird of mustard and charlock—the weeds most injurious in this quarter.

Live Stock.—The pastures were of good average growth. They yielded a full bite all through the season, but I do not think the quality was equal to the quantity. Stock thrive fairly well. Cattle and sheep free

from disease. There were a few cases of anthrax among cattle. *Clip of wool*—Fully an average.

FIFESHIRE (Western District). *Wheat*.—33 bushels; $1\frac{1}{2}$ ton straw. Quality of grain poor; straw good quality when harvested before the rainy weather set in. Seed sown, 4 bushels.

Barley.—32 bushels; 1 ton of straw. Quality of grain very poor, and more so when it was exposed long in the fields. Straw fairly good when well harvested, but the very reverse when the stooks were long exposed. Seed sown, $3\frac{1}{2}$ bushels.

Oats.—34 bushels; $1\frac{1}{2}$ ton of straw. Quality of grain fairly good when harvested before the weather broke, and very poor afterwards. Straw, same applies as in barley. 4 bushels of seed sown on the early farms and as much as 6 on late ones.

Harvest began about the 27th August on the coast-side farms, but a week later on the back-lying ones.

Hay.—The quality was poor, and much of it completely spoiled in the harvesting. Quantity about 2 tons on the good lands, and, say, 25 cwt. on the poorer. *Meadow-hay*.—Heavier than last year, but much of it very badly got or harvested, and the quality poor.

Potatoes.—As is well known, all the earlier varieties are almost all diseased, and an exceedingly poor crop. The later ones are better, and fairly free of disease, but likewise a miserable crop, and, I am sorry to say, considerable quantities still to lift in this quarter.

Turnips.—No second sowing was required, and never did turnips give less trouble or grow better. All over they are a very fine and heavy crop—30 tons on first class lands, and 20 tons on second class.

No damage by insects. Annual weeds were very prevalent and difficult to cope with amongst turnips and potatoes, on account of the growthy weather.

Live Stock.—Pastures much better than last season. Stock thrive very well, cattle especially. Cattle and sheep free from disease. *Clip of wool*.—Good, and the product about an average.

PERTHSHIRE (South-Western District). *Wheat*.—Average yield will be rather under that of last year; 30 to 38 bushels; average yield of straw. The area of wheat sown was about an average. Seed sown about $3\frac{1}{2}$ bushels.

Barley.—On carse land, about 32 bushels; yield of straw under an average. Seed sown, 3 bushels. On dry-field land, 26 to 30 bushels; straw under average; grain good quality. Seed sown, 3 bushels.

Oats.—Yield 36 bushels. Fully average bulk of straw, but in many districts this is badly damaged by wind and rain. Seed sown, 4 to 5 bushels.

Harvest began about same time as last year, but in some of the later parishes a considerable bulk of grain was to be seen in the stooks in November. In fact the harvest has been one of the most protracted for many years.

Hay.—On carse land the bulk of hay was much above the average; yield fully 2 tons; in most cases badly got, and the quality has suffered considerably. On dry-field land the yield was a full average, and in many cases not much behind the carse land; yield 35 cwt. *Meadow-hay*.—Yield about an average, but badly got. Not much grown in this district. The haymaking season was one of the worst in the writer's experience.

Potatoes.—Very poor crop; 4 tons would be a full average for the district. About one-third diseased. No new varieties planted.

Turnips.—About 18 to 20 tons; quality good, but on many farms the

crop suffered from a kind of canker or scab. Brairded well, and little or no damage from turnip-fly. No resowing, and no frosty nights.

No injury by insects. Weeds were more prolific than usual, and on account of wet weather the ground could not be properly worked.

Live Stock.—Pastures fully an average, and stock did well enough, but left a small margin for grazing, as they were too dear in the spring. The reported outbreak of foot-and-mouth disease in the county was proved not to be the true or infectious type. *Clip of wool*—Average.

PERTSHIRE (Coupar-Angus District). *Wheat.*—The yield in this district will be much the same as last year as to quantity, but quality not so good. Average yield from 30 to 36 bushels; seed sown, from 3 to 3½ bushels.

Barley.—This crop is fully better than that of last year as to bulk of straw, but yield of grain not so good either as to quantity or quality, having been much laid and destroyed by excessive rains. Average yield, from 28 to 32 bushels; seed sown, from 3 to 3½ bushels.

Oats.—A full crop; much above the average of last year, and quality good; average yield, from 36 to 44 bushels.

Harvest began at the usual time, about the last week in August, and the weather being favourable for a month, the most of the crops in this quarter were secured in excellent order.

Hay.—This crop was a good average, with abundance of clover, but was in many cases somewhat spoiled in the making with rain; average yield about 2 tons. *Meadow-hay*—Very little made in this district.

Potatoes.—The yield this year is very much under an average, even inferior to last year's crop both as to quantity and quality. Maincrops comparatively free from disease, but all the earlier varieties very much diseased. Average yield from 3 to 4 tons of dressed potatoes.

Turnips.—This crop is a very excellent one, and very much above the average of last year. The braird came away at once, and strong, and no second sowing required. Average yield this year from 20 to 28 tons.

No apparent damage to crops this year by insects. Weeds are a little more abundant this year than usual, especially fat weeds, which were not easily kept down, owing to the continuous wet weather, but did no apparent damage to the crops.

Live Stock.—The pastures this year were much above the average in growth and quality, and stock of all kinds thrive well on them. Cattle and sheep have kept very free from disease of any kind. The *clip of wool* this year was about an average as to quantity and quality, but prices for all home sorts very low.

PERTSHIRE (Strathearn District) *Wheat.*—Very little grown; a heavy crop, about 45 bushels; 3 to 4 bushels sown. Owing to the protracted rains the heads were much discoloured and straw much laid, and got in in very poor condition.

Barley.—A fair average crop, 38 to 48 bushels, but not so well coloured as in previous years on account of the wet, and a good deal remained exposed to heavy rains for weeks after being cut.

Oats.—An average crop; about 45 bushels; 4 to 5 bushels sown. Red-land crop above an average, both in grain and straw, but on account of the excessive wet very disappointing in quality.

Harvest commenced about the middle of August, and was long and protracted owing to the exceedingly wet weather, so that the expense of harvesting was greatly increased and much of the crop very much damaged.

Hay.—A fair average crop, but in many cases was not well secured; average 2 to 3 tons. Clover an exceedingly heavy crop, and very difficult

to get properly secured. *Meadow-hay*—Heavier than last year, but also very difficult to make owing to the heavy rains.

Potatoes.—A poor crop; 4 to 6 tons; a considerable amount of disease, which began early in July. Maincrops and Abundance were the principal kinds grown.

Turnips.—A fair crop, but owing to wet weather were fully three weeks later of being sown. Brairded well. Average 12 to 18 tons. A large amount of finger-and-toe, more especially among yellows in unlimed land. Quality inferior to last year.

Little or no damage done by insects; much less than last year. A good deal of damage done in some parts with weeds, especially charlock.

Live Stock.—Pasture was of good growth all through the season, but not quite so good in quality as last year. Stock thrived well, but in consequence of the excessive wet was less firm than usual. Cattle and sheep have been very free of disease. *Clip of wool*.—A fair average in quantity, but slightly inferior in quality.

PERTSHIRE (Highland District). *Wheat*.—None sown.

Barley.—27 bushels; weight, 52 lb. Straw very much better than last year. Seed sown, 4 bushels.

Oats.—Lea, 40 bushels; 41 lb. weight. Clean land, 39 lb.; quantity about the same as last year. Straw was very bulky.

Harvest was a little late, but the crops were fairly well secured. On the higher ground they were difficult to secure.

Hay.—Quantity and quality about the same as last year. The aftermath was made better. *Meadow-hay*.—The quantity and quality was good, especially in early places. It was not well secured in late places.

Potatoes.—About 3½ tons. The bulbs very small. There was no disease. Up-to-Dates were the heaviest crop, but not so free from disease as other varieties.

Turnips.—About 20 tons on low ground. On the higher ground there would be about 18 tons. There was some second sowing. The turnip crop was the best of the season.

There were few insects. The crops suffered slightly from turnip-fly and frosty nights. There were very few weeds.

Live Stock.—Pastures were looking well, and compared very favourably with last year. Stock did not thrive or fatten well. Cattle and sheep free from disease. *Clip of wool*.—Slightly under the average.

FORFARSHIRE (Western District). *Wheat*.—40 bushels. Both grain and straw fairly good in this district.

Barley.—From 40 to 48 bushels. Straw very abundant, but quality of both grain and straw not so good as last year.

Oats.—48 to 64 bushels. Oats are yielding better than last year. Quality fairly good where well harvested.

Harvest began two days later than last year.

Hay.—From 2 to 3 tons, and where well harvested quality good. *Meadow-hay*.—Very little cut in this neighbourhood; scarcely quotable. Water-banks and other odd bits cut well.

Potatoes.—The yield of this crop, I am sorry to say, has been very light this year in this district, and also very variable as to disease and quality, but, as a rule, quality very bad. I question if farmers will sell more than 3 or 4 tons.

Turnips.—From 25 to 32 tons; brairded well with few exceptions. Small pieces had to be sown twice, but that was, I think, owing to bad

Not much damage by insects. Very little injury by weeds in this neighbourhood.

Live Stock.—The pastures have really been most abundant. I never knew a season when we had so much grass and for so long; quality also very fair. Stock thrived fairly well. Cattle have been practically free from disease, but sheep, at the end of the season, have been affected with sore mouths and feet; some of it developing into foot-rot. *Clip of wool*.—Fairly good; rather over than under an average.

FORFARSHIRE (Eastern District). *Wheat*.—44 bushels of good quality and weight; straw rather above an average; 4 bushels sown.

Barley.—36 to 40 bushels of fair quality and weight; straw about an average; 4 to 6 bushels sown.

Oats.—35 to 40 bushels of good quality and weight; straw full average; 4 to 6 bushels sown.

Harvest began 27th August as against 21st August previous year. Weather fairly good, but in latest districts much of crop damaged by breakdown of weather.

Hay.—Fair crop, about 4½ tons of good quality; weather bad, and a considerable amount damaged. *Meadow-hay*.—None grown.

Potatoes.—Under last year's crop; quality not good except in exceptional cases; 6 to 10 tons; some varieties diseased; very few new kinds grown.

Turnips.—Better crop than last year; 20 to 30 tons. Crop braided well, but a good deal of canker from wet weather.

No insects. Fairly free from weeds.

Live Stock.—Pastures were good till July, when there came too much rain. Stock thrived only middling, owing to wet weather. Cattle and sheep free from disease. *Clip of wool*.—Average, but prices very low.

ABERDEENSHIRE (Buchan District). *Wheat*.—Not grown in this district.

The *Barley* and *Bere* crops were not so good as last year. The yield would be from 30 to 38 bushels, and generally the weight per bushel from 52 to 55 lb. Quantity sown, from 3 to 5 bushels. The grain not generally of a good sample owing to want of sunshine.

Oats.—Not so good a crop as last year. The yield would be from 4 to 5 quarters, and the weight may be stated from 39 to 42 lb. per bushel. Quantity sown, about 5 or 6 bushels. The straw was fair in quantity and quality when secured on or before the 13th October; anything not secured by that time has deteriorated considerably owing to bad weather.

Harvest began about the 1st of September, same time as last year; the later districts not so early, but nearer to the time of the early districts than usual.

Hay.—A very fair average crop and a good deal secured in good order, while the later kind was not got in in so good condition. The weight would run from 32 to 40 cwt. *Meadow hay*.—Not grown to any extent.

Potatoes.—This crop was neither so large or of so good quality as last year. There was no disease to any extent. It was bad weather during time of lifting, and many were not got up before Martinmas.

Turnips.—This crop may be classed as an average one—some very good fields while others are not. The later sown ones have not done well, there having been so much rain during summer. Swedes 15 to 18 tons; yellows, 16 to 20. Very little resowing.

Insects did very little damage; weeds very prevalent owing to excessively wet season.

Live Stock.—Pasture was fully an average. Stock did not do so well as one might have expected, owing to wet season no doubt. There was little or no disease. *Clip of wool*.—About an average.

ABERDEENSHIRE (Formartine District). *Wheat*.—None grown.

Barley.—Last year, 37 bushels; this year, 32 bushels; straw, 10 per

cent short; seed sown, 4 to 4½ bushels. The bushel weight is about 54 lb., or 2 lb. under last year. Much of the grain is of inferior quality, but where well harvested the straw is good.

Oats.—Last year, 39 bushels; this year, 36 bushels; straw, 10 per cent short; seed sown, 5½ bushels, but on high-lying land 6½ bushels. Quality of grain and straw fair, except what was damaged by the continuous wet weather, which set in after the first week of October and continued till date of report, December 8.

Harvest began about the usual time, and the weather was fairly good till towards the end of it, when it began to break.

Hay.—"Seeds"—i.e., ryegrass and clover mixed—are cut for hay, and yielded last year 32 cwt.; this year about the same; quality only moderate. *Meadow hay*—Almost none grown here.

Potatoes.—Last year, 4½ tons; this year, 3½ tons; of poor quality; considerably diseased.

Turnips.—Last year's crop turned out better than expectation, and yielded, say 15 tons. This year's crop will probably average about the same weight. The crop braided well, and little resowing was done.

Not much damage from insects, but great damage from finger-and-toe. The usual damage from knot-grass, couch-grass, &c., which could not be well kept in check owing to wet weather.

Live Stock.—Pastures were extra good. Live stock thrived fairly well. Cattle and sheep free from disease.

ABERDEENSHIRE (Strathbogie District). *Barley*—There was a fair crop as regards straw, but the season being particularly wet, and with an absence of sunshine, the grain did not mature well, the colour generally being dark, and the weight per bushel from 3 to 4 lb. below an average in a fairly good season. The quantity of grain may be stated at about 3¼ quarters, or perhaps less.

Oats.—These were also bulky in straw, but the yield is below an average by several bushels. The weight is also below an average by possibly 2 to 3 lb. Great difficulty was experienced in getting the crop secured in such a way that it would keep in the stackyard.

Harvest.—Owing to the wet and sunless summer the harvest began perhaps a week or ten days later than the usual time, and in several instances it was rather protracted owing to the unsuitable weather.

Hay.—This crop was bulkier than the previous year, and it was well mixed with clover. It was possibly one of the worst seasons to cure it that has been experienced for many years, and much of it was rendered unfit for feeding horses with.

Potatoes.—This crop was most unsatisfactory, the tubers being very small in the run and also of poor quality. There were reports of disease commencing about the end of August, caused no doubt by the unseasonable weather.

Turnips.—This crop has also been remarkably poor. Indeed all over it is little more than half a crop. The crop braided fairly well, but in some instances the plants came rather slowly to the hoe. Little resowing was required. There are numerous complaints of finger-and-toe.

Live Stock.—The pasture was of most unusual growth during the early portion of the season. At that time the weather was warm, and the heavy falls of rain caused a great growth. During the whole season grass was abundant, but towards the end of July it was noticeable that stock was not making the usual progress on the pasture, no doubt owing to the damp bed and the superabundance of moisture in the grass. There has not been any disease among either sheep or cattle. *Clip of wool*—The quality was under an average, and the weight was, in the case of hill sheep, short of an average also.

BANFFSHIRE (Lower District). *Wheat*.—Almost none grown.

Barley.—Appearance of growing crop very good ; as a rule plenty of straw ; but on handling the crop it is disappointing in the yield of grain and weight, both being under last year ; quantity, say about 4 quarters as an average ; and in weight more being under 56 lb. per bushel than above it ; seed sown, 4 bushels.

Oats.—More satisfactory crop than barley. Lea and "Yaval" are a big crop ; after turnips, as a rule, not so heavy. Quality, where well harvested, fully up to last year, but weight rather less ; quantity much the same as last year, say about 5 quarters ; seed sown, 5 to 6 bushels.

Harvest began about the usual time, first week of September, and was mostly finished by the end of the first week of October. On the whole a fairly good harvest, though at times rather disappointingly slow.

Hay.—Not quite an average, and in many cases, from the character of the weather, quality deteriorated in the harvesting. *Meadow-hay*.—Not much grown.

Potatoes.—Rather an irregular crop ; not up to an average ; with more disease than usual, particularly among the earlier varieties. The Champion seems to be among the best disease-resisting varieties.

Turnips.—Were an irregular crop. On good well-farmed land there are many fine turnips, but where land is not properly drained, or inclined to be wet, they are a miserable failure. All over, however, they might be about the same as last year, which was under an average.

No injury by insects. The weather being so continuously wet no satisfactory second hoeing could be accomplished, and whatever weed was there to grow got too much its own way.

Live Stock.—In the latter half of the season pastures were good, though rather deficient in the earlier part. Stock did fairly well, coming off the grass at end of season in good condition. Cattle and sheep fairly healthy, though cases of anthrax have been rather common. *Clip of wool*.—About an average.

BANFFSHIRE (Upper District). *Wheat*.—None grown.

Barley.—A fair proportion sown on most farms ; returns under an average ; 3 to 5 quarters ; weight from 52 to 55 lb. Harvested in good order in last weeks of September and first week of October. Seed sown, 4 to 5½ bushels.

Oats.—Good average crop as to straw ; grain much under average ; quantity, 2 to 3 quarters ; 38 to 41 lb. per bushel. A considerable breadth exposed in seven to ten weeks, and wellnigh destroyed by wet and game.

Harvest began much about the usual, but in the middle of September there was general work, and the wet weather prolonged the finish even on to December.

Hay.—A good crop as to quality ; from 20 to 30 cwt.

Potatoes.—Only about half the usual crop, and older varieties much diseased.

Turnips.—Little over half a crop ; suffered most from the excessive rains, which were almost constant from the middle of June.

Very little fly damage to braird ; the roots are, however, considerably affected by canker where the five-course is practised. Weeds unquarable among turnips either by manual or horse hoe.

Live Stock.—Short grass season ; late in coming, and cold cut it off much too soon. Stock had to be stall-fed with cut grass and tares sooner than usual, and were much under usual condition. Happily no disease. *Clip of wool*.—Fair.

MORAYSHIRE. *Wheat*.—Not much wheat sown. Average crop 1899 was about 35½ bushels ; crop 1900 about 36½ bushels, being 1¼ bushel better

than last year. Weight and quality not so good as last year ; from 3 to 4 bushels generally sown.

Barley.—Average crop 1899 was 33 bushels ; crop 1900 was 32½ bushels, being much about the same as last year. The crop in many districts was very disappointing, although at one time it promised a fair average, yet at reaping-time it proved thin and short and of small head, and in the stackyard was very disappointing in bulk. Owing to the fine harvest weather the colour and weight a fair average ; from 54 to 56 lb. From 3½ to 4 bushels seed sown.

Oats.—Average of crop of 1899 was 35½ bushels ; crop 1900 about 39½ bushels, being about 4 bushels over last year's return. In many parts this crop was very heavy, but the excessive continued heavy rains about the end of July and beginning of August did great damage by flattening it to the ground, and reducing it considerably both in yield, weight, and quality ; from 4½ to 5 bushels seed sown.

Harvest began about the usual time—the 20th to the 26th of August.

Hay.—This crop was much better than last year as to weight, but very much inferior in quality, owing to a long continuance of wet weather during haymaking. Average, about 27½ cwt., being 4½ cwt. over last year's return. *Meadow-hay*.—Not much grown, but a much better crop than last year, say about 29 cwt.

Potatoes.—A fair crop ; average about 5½ tons, ½ ton more than last year's return ; quality much better than last year, and freer from disease. No special new variety planted.

Turnips.—A fair average crop where they are free from finger-and-toe. Average for the county is about 17½ tons, 3½ tons over last year's return. Some fields have weighed up to 34 tons at the nitrate competition, but these are exceptions. The crop braided in some places badly, and was much destroyed with fly, and some required to be resown. But the fine autumn and end of the year has helped the turnip crop greatly.

The crop was injured both by fly and finger-and-toe. The damage was greater than the average of former years, but less than last year. The crop was slightly injured by weeds. The continued wet weather prevented the necessary second hoeing and drill-harrowing being prosecuted as they would have otherwise been.

Live Stock.—The pastures during the season were of average growth, but owing to the wet summer the stock did not thrive quite so well as one would have expected. Cattle and sheep quite free from disease. *Tip of wool*.—Quality about an average of former years, but rather better than last year's clip.

NAIRNSHIRE. *Wheat*.—None grown.

Barley.—30 bushels ; quality under last year owing to rainy season ; seed sown, 4 bushels.

Oats.—38 bushels ; quality under average owing to rain ; seed sown, 5 to 6 bushels.

Harvest began about usual time.

Hay.—Rather over last year's crop ; a good deal spoiled by rainy season. *Meadow-hay*.—None in district.

Potatoes.—Yield about equal to last year. Early varieties much diseased, a little only in later varieties.

Turnips.—16 to 24 tons ; rather over last year. Came up well ; only once sown. A good deal of canker.

No injury by insects or by weeds.

Live Stock.—Pastures during the season of average growth and quality with last year. Stock thrives pretty well.

INVERNESS-SHIRE (Inverness District). *Wheat*.—Very little sown in the

county, but the average yield of the area under crop will not be 40 bushels. Quantity sown about 3 bushels; quality good.

Barley.—The crop was a very fair one in appearance, but the result of the threshing was disappointing, it being at least one quarter under last year, or about 30 to 32 bushels. Quantity sown, about 4 bushels; quality, very fair.

Oats.—The crop was a very good one, but the wet season told considerably, and the crops were lodged badly. Yield, about 40 bushels; quantity, sown, 4 bushels.

Harvest began about the usual time, but was much protracted in the later districts owing to the wet weather prevalent.

Hay.—About $1\frac{1}{2}$ tons; quantity less than in 1899, and quality scarcely so good.

Potatoes.—About one-third less than an average on most farms, while there must be fully one-half on others. Very little disease in the district except in early varieties. A few new varieties did well.

Turnips.—The crop has been under an average and bad owing to the open season. Swedes and yellows both improved much; average yield, from 20 to 24 tons on best soils. The crop braided well.

No damage by insects. The weeds were very difficult to eradicate owing to the damp season.

Live Stock.—Pastures full average growth. Stock thrived very well. Cattle and sheep free from disease. *Clip of wool*—Fair.

INVERNESS SHIRE (Skye). *Wheat*.—None grown.

Barley.—None grown.

Oats.—An average crop; 6 bushels usually sown

Harvest began about the usual time.

Hay.—Clover and ryegrass one-fourth better. *Meadow-hay*—About the same as last year

Potatoes.—A very poor crop; disease prevalent more or less all over the district. Spraying tried to a small extent, but results do not seem very satisfactory.

Turnips.—About the same as last year. Finger- and -toe prevalent. Only one sowing. A poor crop.

No injury by insects or by weeds.

Live Stock.—Pastures during the season of average growth and quality with last year. Stock thrived well on the pastures. Cattle and sheep free from disease. *Clip of wool*—Light, but of good quality.

INVERNESS-SHIRE (Lochaber District). *Wheat*.—None grown.

Barley.—Very little grown.

Oats.—Both quantity and quality of straw, as well as of grain, under that of 1899; yield, say 24 bushels; general sowing at rate of 6 bushels.

Harvest began at the usual time.

Hay.—Quantity about same as last year ($1\frac{1}{2}$ ton); quality not so good.

Meadow-hay—Crop less, and very great difficulty in saving it owing to continuous wet weather.

Potatoes.—Yield far below last year; quantity, say $3\frac{1}{2}$ tons. A good deal of disease, which commenced early in August. Quality as well as quantity very inferior in 1900, and this almost universal throughout the Highlands. No new varieties planted.

Turnips.—Weight about 10 tons; quality not equal to last year. Crop braided well, and no second sowing necessary.

No injury by insects or by weeds.

Live Stock.—Pastures rather above average growth. Owing to so much and almost continuous rain stock did not thrive very well. Cattle and sheep quite free from disease. *Clip of wool*—Rather under average.

ROSS-SHIRE (Dingwall and Munlochy District). *Wheat*.—Quantity and quality of grain and straw up to average; seed sown, about 4 bushels.

Barley.—Quantity of grain and straw below average; quality average; seed sown, 4 bushels; yield, 34 bushels.

Oats.—Quantity and quality of grain and straw average; yield, say 42 bushels; seed sown, $4\frac{1}{2}$ to 5 bushels.

Harvest began about the usual time, 20th August.

Hay.—Quantity and quality of hay crop, both of clovers and ryegrass, average; weight, say $1\frac{1}{2}$ tons. *Meadow-hay*.—None.

Potatoes.—Crop very light; early varieties much diseased; quantity not over 4 tons; quality fair. Disease appeared about the middle of July.

Turnips.—Weight of swedes, 10 to 25 tons; yellows, 8 to 20 tons. Braided well in general. Very little resowing. Finger-and-toe very evident in some cases.

Not more than usual damage by insects. Not more than usual injury by weeds.

Live Stock.—Pastures fully average growth and quality. Stock thrive well. Cattle and sheep free from disease. *Clip of wool*.—Average.

ROSS-SHIRE (District of Tain, Cromarty, and Invergordon). *Wheat*.—Fully better average than last year, say 36 bushels; average quality; seed sown, $3\frac{1}{2}$ to 4 bushels.

Barley.—Much the same quantity; quality not so good, seed sown, 3 to $3\frac{1}{2}$ bushels.

Oats.—Better than last year a little; good quality; 44 to 46 bushels; seed sown, $3\frac{1}{2}$ to $4\frac{1}{2}$ bushels.

Harvest began 18th to 24th August.

Hay.—Much the same as last year, but better quality, $1\frac{1}{2}$ to 2 tons. *Meadow-hay*.—None grown.

Potatoes.—Light yield; about same as last year. No disease. 4 to 5 tons marketable.

Turnips.—Where free from finger and-toe a full crop. Yellow, 20 to 24 tons; swedes, 26 to 28 tons. No second sowing.

No injury by insects. Weeds—skellocks prevalent.

Live Stock.—Pastures more than average growth owing to much rain, but not average quality. Stock did not thrive so well. Cattle and sheep free from disease. *Clip of wool*.—Average.

SUTHERLAND. *Wheat*.—None grown.

Barley.—32 to 35 bushels; below average quality; colour not good owing to wet weather; seed sown, $3\frac{1}{2}$ bushels.

Oats.—40 to 44 bushels—on best lands to 48 bushels; below average weight; straw crop good; seed sown, 4 to 6 bushels. Broken and wet weather at harvest, which was tedious and prolonged.

Harvest began a few days later than the usual time.

Hay.—A fair crop and quality; about $1\frac{1}{2}$ tons; clover little deficient; ryegrass average. *Meadow-hay*.—Little grown; fair crop; in late places above average.

Potatoes.—Light; disease in places; 4 to 5 tons.

Turnips.—Good average crop; 15 to 20 tons on best lands. Braided well. Very few second sowings.

Little, if any, damage by insects noticed. Damage by annual weeds considerable. On account of wet weather the weeds in turnip-land could not be kept under.

Live Stock.—Pastures of average growth, but quality not so good. Stock in early part of summer and to early autumn thrive well, but last three months of year badly on account of continuous rain. Free from disease. *Clip of wool*.—Quality good, but slightly under average.

CAITHNESS SHIRE. *Wheat*.—None grown

Barley.—Fair crop of about 36 to 38 bushels; straw in proportion Grain light, and much damaged if not secured almost after cutting; weight about 48 lb. per bushel.

Oats.—Large crop—better than seen in Caithness for years Cutting got through in time, and when cut looked a crop of 5 quarters. In many places straw is also of good quality, but a three months' harvest rendered the crop worthless, and only the best and early portions were saved in good order.

Harvest began about the last week in September. Such a persistently wet and dragging harvest has not been seen for forty years. The consequence is both grain and fodder are of very poor quality.

Hay.—A good crop, just saved in time. *Meadow-hay* had to rough it, and sustained a deal of damage.

Potatoes.—No crop—that is, a return not much more than the seed.

Turnips.—Some farms have a few, many have none at all—a clear blank. It is only along our coast-line where an average crop has been got, otherwise you may look upon the county as a blank.

Too much rain prevented observations as to insects. Damage from weeds much greater, as we could not get between the drills with the horse-hoe. Then, again, the daily rains only increased the evil caused by the hoe, as we just transplanted the weeds, so that, I am safe to say, we have samples of all kinds

Live Stock—Pastures were over an average growth, but inferior in quality, caused by an excess of moisture and want of sunshine. Stock throve middling. On dry land they have summered fairly well, but we have to face the most trying time yet. As yet no disease among stock, although sheep farmers are in deadly fear of fluke. There has as yet been no sign. *Clip of wool*—About an average; of fair quality.

ORKNEY. *Wheat*.—None grown.

Bere.—The average yield was about 42 bushels, weighing about 50 lb., being much better than last year; seed sown, $3\frac{1}{2}$ to $4\frac{1}{2}$ bushels.

Oats.—A good crop of both grain and straw, much better than last year; but owing to the long wet harvest a good deal of the crop was secured in rather a damp state; average 36 bushels, weighing $39\frac{1}{2}$ lb.; seed sown, 4 to 6 bushels.

Harvest began about a week after the usual time, and was the wettest and longest in the memory of most farmers.

Hay.—There was a good average crop; weight about 25 cwt.

Potatoes.—A fair good crop; weight, 4 to 5 tons; some disease.

Turnips.—Braided well, but heavy and frequent showers, followed by warm weather in July, caused a lot of finger-and-toe. Crop not so good as last year; weight about 9 tons.

Little damage from insects. The wet warm weather in July caused the weeds to flourish.

Live Stock.—The pastures were poor in spring, but good all summer and autumn. Stock healthy and throve well. *Clip of wool*—Average.

SHETLAND (Lerwick District). *Wheat*.—None grown.

Barley.—Straw and grain both of better quality than last year. Yield about the same

Oats.—Straw and grain both of better quality than last year. A larger yield of straw and a smaller yield of grain.

Harvest was a good fortnight later than usual.

Hay.—The yield of both ryegrass and clover was larger than last year. The quality much the same. *Meadow-hay*—The crop was less productive than last year. The quality much the same.

Potatoes.—The yield and quality were not so good as last year. No disease. No new varieties planted.

Turnips.—The crop is of equal quality, but the weight is less than last year. The crop did not braird well owing to cold and dry weather, and a second sowing was required in many places.

No injury by insects. Weeds were more plentiful than usual, and did some damage, notably charlock.

Live Stock.—Pastures during the season of average growth and quality with last year. Stock thrived very well, and were free from disease. *Clip of wool*—The quality was good, and rather under the average in weight.

THE METEOROLOGY OF 1900.

The following table shows a comparison of the winds, mean pressure, temperature, rainfall, cloud, and sunshine for 1900 as compared with the forty-five years from 1856 to 1900:—

TABLE SHOWING FOR WIND DIRECTION AND FORCE, MEAN BAROMETRIC PRESSURE, MEAN TEMPERATURE, RAINFALL, CLOUD, AND SUNSHINE OF 1900, AND THE EXCESS ABOVE, OR THE DEFECT FROM, THE AVERAGES FOR ALL SCOTLAND FOR FORTY-FIVE YEARS.

	DIRECTION OF WINDS—DAYS.								Wind Force.	Barometric Pressure.	Temperature.	Rainfall	Cloud	Sunshine.
	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.						
									lb. per sq. ft.	inches	°	inches	0 to 10.	hours.
Jan. .	0	1	1	-1	-1	-2	2	0	0	-0.41	1.3	1.28	0.30	- 11
Feb. .	2	1	1	0	1	-3	-3	0	1	-0.20	-6.1	0.50	-0.22	- 4
March .	2	2	0	1	-2	-1	-2	1	1	-0.36	-0.248	-2.1	-1.53	0.06
April .	-1	-2	-2	-1	0	0	4	2	0	-0.15	-0.038	1.5	0.44	0.16
May .	0	1	0	-1	1	-1	0	0	0	0.28	-0.017	-0.3	0.23	0.80
June .	0	1	1	1	1	-1	-1	-2	0	-0.45	-0.056	0.8	0.59	0.82
July .	0	0	0	0	0	0	-1	1	0	-0.11	0.044	1.7	0.46	0.98
August	1	2	3	1	-1	-3	-2	-1	0	-0.08	0.062	-0.8	0.84	0.47
Sept.	0	-1	-2	-1	1	0	4	0	-1	-0.30	0.115	1.0	-0.27	-0.40
Oct. .	1	-1	-2	-3	-1	-1	3	3	1	-0.01	-0.008	-1.0	1.08	0.22
Nov .	-1	0	2	1	0	-1	-1	-1	1	-0.04	-0.134	1.1	1.08	0.72
Dec.	-2	-1	0	0	-1	1	2	1	0	0.91	-0.162	4.7	2.85	1.00
Year .	2	3	2	-3	-2	-14	5	4	3	-0.20	-0.018	0.1	7.55	-126

Hence the most striking features of the weather of 1900 were the excessively low temperature of February, which was 6°·1 under the average; the excessively high temperature of December, which was 4°·7 above the average; the excessively heavy rains of the last quarter, amounting to 5 inches above the average; and an unbroken deficiency of sunshine in the important months from April to August.

JANUARY.—The mean temperature was $38^{\circ}\cdot5$, or $1^{\circ}\cdot3$ above the average, the days being $1^{\circ}\cdot0$ and the nights $1^{\circ}\cdot7$ higher. This excess of temperature was nearly equally distributed over the country. A striking feature of the temperature was the comparatively high temperature which prevailed during the nights, the only previous Januarys comparable in this respect were 1882 and 1898. At Leith the lowest reading was $32^{\circ}\cdot1$.

The mean rainfall was 5·14 inches, or 25 per cent above the average. Its distribution was very peculiar, being only slightly above the average, or in some cases under it, in Galloway and the west coast from Cape Wrath to Skye; but in all other parts of the country above the average, and over extensive breadths very considerably so. The greatest excess was on the coast of the Moray Firth and for some distance inland, being generally about 60 per cent, and between two lines, one drawn from Islay to Aberdeen and the other from Ayr to the mouth of the Tweed. Here the excess was generally one-half more than the average, but rising to 73 per cent at Pladda and Smeaton in East Lothian, 90 per cent at Montrose, and 103 per cent at Campbeltown. The month was persistently rainy throughout, there being no day in the month on which rain did not fall at a large number of the stations. At the top of Ben Nevis 35·32 inches fell, being the heaviest fall hitherto recorded there in January.

FEBRUARY.—The mean temperature was $32^{\circ}\cdot2$, or $6^{\circ}\cdot1$ under the average, the days being $5^{\circ}\cdot2$ and the nights $7^{\circ}\cdot1$ colder than usual. The only other colder February recorded was in 1895, when the mean was $29^{\circ}\cdot0$, and in that month a like excess of north-easterly winds prevailed. As happens in times of great cold, it was most severely felt in inland situations, whereas round the coasts the weather was much less severe. The great cold of 1895 was accompanied with a high barometric pressure, whereas in 1900 pressure was low. In both cases, however, pressure was much higher in the north and west than in the south and east, and consequent on this like distribution of pressure northerly and easterly winds prevailed in both cases.

The mean rainfall was 3·55 inches, or 14 per cent above the average. The rainfall, inclusive of rain and melted snow, was above the average in the east from the mouth of the Spey to the Cheviots for a considerable distance inland; in Galloway, south Ayrshire, Bute and Arran, and at a few scattered stations in Caithness and Orkney. In all other parts of Scotland less than the average was collected. In several places the precipitation was much in excess, being above the averages in percentages—210 at Duns Castle, 145 at Broomlands, 125 at Gordon Castle, and fully 75 per cent at Haddo House, Logie Coldstone, Roslin, Leith, Aberlady, Smeaton, and The Glen. On the other hand

less than half the average fell at many places in the Hebrides and in the counties of Ross and Inverness. The third week of February 1900 will be long remembered for the widespread and severe wind and snowstorms, for the shipping disasters all round the Scottish coasts, and for serious interruption to telegraphic and railway communication.

MARCH.—The mean temperature was $37^{\circ}3$, or $2^{\circ}1$ less than the average, the deficiency being equally distributed between the days and the nights. Temperature was considerably lower in the east and south than in the west and north. In Galloway the deficiency was $2^{\circ}5$, but in Orkney only a degree.

The mean rainfall was 1.31 inch, or 54 per cent under the average. The greater portion of this precipitation fell as snow. To the east of a line passing through Montrose, Braemar, Nairn, Invershin, and Dunrobin, it exceeded the average, the excess being occasioned by the heavy snowfalls. Over this district the excess was generally 30 per cent. Everywhere else the amounts were under the average. Over nearly the half of Scotland, only from a tenth to a fourth part of the average fell. During the first fortnight little or no rain or snow fell. At the Ben Nevis Observatory, which was in the very dry district, 3.84 inches were collected, being the lowest hitherto recorded for March, and was thus a strong contrast to the preceding January, when the amount was 35.32 inches, or nearly ten times more.

APRIL.—The mean temperature was $45^{\circ}7$, or $1^{\circ}5$ above the average, the days being $3^{\circ}0$ above, while the nights were only equal to the average. Thus the higher temperature was wholly caused by the greater warmth of the days. In Caithness and Shetland temperature was about half a degree under the average; but temperature rapidly increased on advancing inland towards the south-east till it rose to $2^{\circ}0$ above the average over the district between the Forth and the Tweed. On the other hand, it was only about half a degree over Galloway, the south of Ayrshire, and Argyllshire. At the end of the third week temperature was unusually high for the season, when the absolutely highest temperature, $75^{\circ}4$, occurred at Aberdeen on the 20th. On the other hand, the temperature was low on the first and fourth weeks.

The mean rainfall was 2.66 inches, or 20 per cent above the average. The rainfall was under the average to the east of a line drawn from Peterhead, and passing Braemar, Dollar, and Rosewell to the mouth of the Tweed, the prevailing W.N.W. winds being drained of much of their moisture in crossing the Grampians. Over this important agricultural part of Scotland the deficiency was from a third to a half of the average rainfall

of the month. Over all other parts of the country the rainfall exceeded the average, the greatest excess, nearly double the average, falling over the districts to the north of the Grampian range. At stations in the west, from Mull to the Solway, the excess was only from one-sixth to half the average. The larger portion fell from the 10th to the 16th. Fogs were widespread in the west on the 18th and 19th, and even more so from the 21st to the 24th. Storms occurred from the 3rd to the 5th in Orkney and Shetland, and from the 12th to the 16th south of the Grampians.

MAY.—The mean temperature was $48^{\circ}\cdot7$, or $0^{\circ}\cdot3$ less than the average, the days being $0^{\circ}\cdot5$ less than the average and the nights the average. The distribution of the temperature was very irregular, being above the average within the space circumscribed by a line passing through Dundee, Kingussie, Glencarron, Monach, Barrahead, Campbeltown, Turnberry, Roslin, and St Abbs. The highest mean temperature, about a degree above the average, was in Mid and East Lothians, and Lower Clydesdale. On the other hand, in Galloway, Islay, and Orkney, temperature was about a degree under the average, and in Shetland so much as a degree and a half.

The mean rainfall was 2·52 inches, or 10 per cent above the average. Its distribution was very irregular, being above the average in Caithness, the Outer Hebrides, and to the south-west of a line passing through Glenquoich, Braemar, Dollar, Dumbarton, Leadhills, and Wolfelee. Over this large area the excess was generally 50 per cent, which, however, was greatly exceeded at individual stations, being, in percentages, above the average—135 at the Mull of Kintyre, 120 at Leadhills, 103 at Stronvar, 89 at Cally, and 82 at Fort William. Elsewhere the rainfall was less than the average, the greatest deficiency being south of the Firth of Forth and in Aberdeenshire, where the amount was only half the average. Nearly the whole of the rain fell during the first and third weeks. The first five days of the month were stormy, especially in the west.

JUNE.—The mean temperature was $55^{\circ}\cdot7$, or $0^{\circ}\cdot8$ above the average, the excess being equally partitioned between the days and the nights. Owing to the great excess of easterly winds from the North Sea, which in this month is much lower in temperature than the land, the mean temperature over a narrow strip along the whole of the east coast was under the average, the deficiency at some of the stations amounting to a degree and a half; and it is deserving of remark that a like deficiency of temperature extended inland down the Caledonian Canal as far as Fort Augustus. Over every other part of Scotland

temperature was above the average, the greatest excess, from $2^{\circ}0$ to $3^{\circ}5$, being at western stations—that is, just in those districts to which the easterly winds arrived after the longest passage over the heated land.

The mean rainfall was 3.17 inches, or 23 per cent above the average. The distribution was extremely irregular. It was under the average from the Firth of Forth to Montrose; in the extreme north-east of Aberdeenshire; at the head of the Moray Firth; in Caithness, Orkney, and Shetland; and over nearly the whole of the west coast from Cape Wrath to the Mull of Galloway. In these scattered districts the deficiency varied from 25 to 75 per cent. Over all the rest of Scotland the rainfall exceeded the average. In some places the excess was great, being, in percentages, 122 at Dumbarton, 113 at Stobo Castle, 100 at Cally, and more than 75 per cent at Dumfries, Glasgow, Lednathie, and Haddo House. The first five days of the month were without rain, but during the rest of the month rains were frequent and widespread. Thunderstorms with heavy rains were unusually frequent, especially on the 6th, 10th to 13th, 20th to 23rd, and 30th—the thunderstorm of the 11th being remarkably severe. No storm of wind was reported. With the easterly winds fogs were frequent and persistent on the eastern seaboard.

JULY.—The mean temperature was $58^{\circ}9$, or $1^{\circ}7$ above the average, the days being $1^{\circ}1$ and the nights $2^{\circ}2$ above the respective averages. The distribution of temperature was very unequal. It was half a degree under the average where northerly winds prevailed most; whereas in the south, where winds were southerly, temperature on advancing southwards was gradually higher, till in Berwickshire it was fully $3^{\circ}0$ above the average. As this district is well protected to westward and southward by broad ranges of hills, the winds on arriving there become drier and the sunshine consequently stronger and more continuous. The warmest weather was from the 11th to the 20th, and from the 23rd to 28th.

The mean rainfall was 3.61 inches, or 15 per cent above the average. The amounts of the rainfall were very unequally distributed. South of the Forth and Clyde it was generally under the average, but to no great extent; and also slightly under the average in the west of Ross-shire. On the other hand, it was above the average in Shetland, Orkney, Caithness, and also in the east coast, and to a considerable extent inland as far south as Fife. The excess exceeded 70 per cent at Bressay, Stromness, Thurso, Pentland Skerries, Dunrobin, and Gordon Castle. A marked feature was the frequency with which it fell, and quite a remarkable absence of heavy daily

falls anywhere. No storms of wind occurred, but thunderstorms of wide extent were of general occurrence.

AUGUST.—The mean temperature was $55^{\circ}\cdot8$, or $0^{\circ}\cdot8$ less than the average, the days being $1^{\circ}\cdot1$ and the nights $0^{\circ}\cdot6$ under the average. The distribution of the temperature was unusually abnormal. Everywhere to the north and west of a line from Inverness, passing down the Caledonian Canal to Oban and thence to Greenock and Loch Ryan, temperature was above the average; but in all other parts of the country it was under the average, the greatest deficiency, from $1^{\circ}\cdot5$ to $2^{\circ}\cdot0$, occurring in the east from Kinnaird Head to the Tweed at the places to which the easterly winds arrive direct from the sea. But as these winds advanced westwards they gradually took a higher temperature with them from the heated land, so that temperature was a degree above the average at Rothesay, Poltalloch, and Skerryvore, and nearly two degrees in the Outer Hebrides.

The mean rainfall was 4·46 inches, or 23 per cent above the average. It was under the average in Shetland, Orkney, Caithness, Sutherland, Wester Ross, and detached portions of Perthshire and Argyllshire, the deficiency scarcely anywhere amounting to the third of an inch. In other parts of the country the rainfall exceeded the average, the greatest excess being south of the Forth and Clyde. The greatest was about 80 per cent in the counties of Berwick and Roxburgh, and a little over 50 per cent in Galloway. Very heavy rainfalls are reported on the 1st, 6th, 12th, 19th, 22nd, and 31st, the weather thus differing widely in this respect from July. On these dates daily falls of upwards of an inch were frequent, and daily falls exceeding 2 inches were not uncommon. These rains often accompanied high winds, and much damage was thus done to the standing crops, and the use of the reaping machine was seriously interfered with.

SEPTEMBER.—The mean temperature was $53^{\circ}\cdot8$, or $1^{\circ}\cdot0$ above the average, the days being $2^{\circ}\cdot3$ above and the nights $0^{\circ}\cdot4$ below the average, being the simple result of the strong sun heat through the dry atmosphere which prevailed. The increase of temperature was pretty equally distributed over the country.

The mean rainfall was 3·33 inches, or 8 per cent under the average. It was above the average in Shetland, Orkney, the West Coast from Cape Wrath to the Mull of Kintyre, the Outer Hebrides, Kinross, and West Perthshire. The excess was 90 per cent at Stornoway, and fully 50 per cent at Stromness, Cape Wrath, Stoorhead, and Fladda. In all other districts the rainfall was less than the average, the greatest deficiency, about 50 per cent, being in the north-east of Aberdeenshire, at

Montrose, and in Lower Tweeddale. Nearly all the rain fell from the 4th to the 10th and 18th to the 30th. The heaviest daily falls, many considerably above an inch, were recorded from the 26th to the end of the month. The largest rainfall at any station was 16·96 inches on Ben Nevis, and the smallest 1·14 at Montrose, and 1·15 inch at Broomlands. The month was remarkable for the all but complete absence of thunder.

OCTOBER.—The mean temperature was 45°·5, or a degree under the average, the days being 0°·4 and the nights 1°·5 under the average. Hence the low temperature was mainly caused by the greater cold of the nights due to the great prevalence of westerly winds. The greatest depression of the temperature occurred at eastern and inland stations to the north of the latitude of the Firth of Tay, being generally about a degree and a half; whereas to the south of this and at strictly western stations it was only half a degree, and over considerable portions of these divisions temperature was about a third of a degree in excess of the average.

The mean rainfall was 5·12 inches, or 2 per cent above the average. Its distribution over the country was singularly unequal, being above the average except in a few scattered districts in the Hebrides, Aberdeenshire, and round the shores of the Moray Firth, where it was slightly under the average. The largest amounts, fully 50 per cent in excess of the average, occurred in Mid and East Lothians, and in localities in the counties of Fife, Berwick, Ayr, Orkney, and Shetland. Much the larger proportion fell during the first half of the month, the heaviest falls being recorded from the 4th to the 13th, on the 17th and 31st.

NOVEMBER.—The mean temperature was 40°·0 or 1°·1 above the average, the days being 0°·7 and the nights 1°·5 above the average. Thus the higher temperature was occasioned by the warmer nights. The temperature was everywhere above the average, the excess being greatest at eastern stations and least in western and inland situations.

The mean rainfall was 4·92 inches, or 28 per cent above the average. South of the Grampians the rainfall was everywhere above the average; also round the Moray Firth and to the east of a line drawn from Inverness to Cape Wrath. The greatest excess, fully 50 per cent above the average, occurred in eastern districts from the Dee to the Tweed. The greatest percentages above the averages were 117 at Aberlady and 114 in Edinburgh.

DECEMBER.—The mean temperature was 42°·7, or 4°·7 above the average, the excess of the days and nights being nearly equal. This extraordinarily high temperature was generally distributed over all districts of the country, except

that it was somewhat greater in inland situations than near the coasts, just as usually happens with this type of weather. During the past forty-five years, as regards December, the highest mean temperature was $45^{\circ}0$ in 1857, then follow $42^{\circ}9$ in 1865, and $42^{\circ}7$ in 1900. The absence of very low temperatures was a marked feature of the meteorology of the month, an examination of the stations showing that at many the temperature did not once fall to freezing.

The mean rainfall was 7.01 inches, or 69 per cent above the average. The rainfall was very slightly under the average in the eastern portions of the counties of Aberdeen and Caithness, the greatest deficiency being 24 per cent at Haddo House, and 12 per cent at Wick. Everywhere else in Scotland it was above the average, the greatest excess being, in percentages, 157 at Kingussie, 141 at Stronvar, 130 at North Esk Reservoir and Cromarty, and upwards of 100 per cent at Wolfelee, Drumlaurig, Paisley, Rosewell, Stirling, Fort Augustus, and Invergarry. A larger rainfall for December has hitherto only been exceeded once—viz., in 1876, the amount in the December of that year being 7.57 inches. It falls also to be noted that in December last rain fell on twenty-five days on the average of all the stations, this being the largest number of rainy days recorded in any month since January 1856.

In the principal grain-growing districts cutting commenced nearly at the average date, but in colder districts it was about a week late. About the beginning of harvest the appearance on the ground indicated a full average crop. Shortly thereafter heavy rains set in with high winds, doing serious damage to the quality of the grain and rendering the use of reaping-machines altogether or wellnigh impossible in many places.

Wheat was a good or a full average to the north of the Firth of Forth, but to southward the crop did not quite come up to an average. *Barley*, to the north of the Grampians and to the south of the Forth and Clyde, was under the average, and the crop was further much damaged by the rains. In the middle districts the crop was the average, and in some districts a full average. *Oats* was a good full average; but in Aberdeenshire, Banffshire, and some other restricted districts, the quality of the grain seriously suffered from the wet weather and the want of sun.

Except in a few scattered localities the *potato* crop did not reach the average. In Fife and westwards, and over the southern counties, the crop was very deficient, being less than half the average over wide districts. In several of the districts disease was prevalent. *Turnips*, except in the extreme north, were everywhere a very fine crop, being in several places well up to a record crop.

AGRICULTURAL STATISTICS.—RETURNED UPON 4TH JUNE 1900.—(Compiled from the Government Returns.)

COUNTIES.	CORN CROPS										GREEN CROPS.										Total Acreage under Fallow, Bare Fallow, and Grass.	Total Acreage			
	Wheat.		Barley or Oats.		Rye.		Beans.		Peas.		Total.		Turnips.		Mangel.		Vegetables or Laters.		Other Green Crops.				Total.		
	Acres.	Bare or Under Fallow.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.			Acres.	Acres.	
1. Aberdeen	630,422	17	102,019	182,541	170	404	385	213,202	7,573	90,346	7	109	2,318	855	100,503	282,545	37,580	282,545	37,580	282,545	37,580	282,545	37,580	282,545	
2. Antrim	135,055	1	1,635	17,346	533	78	15	19,611	4,552	5,352	43	201	20	32	10,206	26,392	78,734	26,392	78,734	26,392	78,734	26,392	78,734	26,392	
3. Argyll	921,597	976	1,661	44,142	1,432	978	43	45,412	8,400	6,552	677	819	33	285	16,705	101,407	164,698	101,407	164,698	101,407	164,698	101,407	164,698	101,407	
4. Barr.	160,264	52	10,168	47,367	1,641	144	31	57,836	9,340	22,260	67	29	906	11	25,217	67,669	9,589	67,669	9,589	67,669	9,589	67,669	9,589	67,669	
5. Berwick	190,775	1,003	21,139	35,122	41	858	44	47,107	2,879	27,322	284	770	773	5	81,583	58,467	43,683	58,467	43,683	58,467	43,683	58,467	43,683	58,467	
6. Bute	25,910	4	1,138	4,903	91	62	10	5,198	974	1,477	14	101	12	12	2,585	8,656	9,804	8,656	9,804	8,656	9,804	8,656	9,804	8,656	
7. Caithness	112,300	4	1,212	32,699	173	3	36	35,127	1,658	13,746	2	32	899	7	15,562	32,289	28,920	32,289	28,920	32,289	28,920	32,289	28,920	32,289	
8. Clackmannan	15,596	282	494	2,912	468	4	4	4,156	407	909	4	28	20	22	1,290	3,431	6,327	3,431	6,327	3,431	6,327	3,431	6,327	3,431	
9. Dumfriesshire	61,587	1,037	389	6,704	19	144	4	7	43,548	9,917	18,043	277	1,130	39	62	16,877	80,871	111,780	80,871	111,780	80,871	111,780	80,871	111,780	
10. Dundee	259,730	1,023	659	42,732	18	4	7	43,548	9,917	18,043	277	1,130	39	62	16,877	80,871	111,780	80,871	111,780	80,871	111,780	80,871	111,780	80,871	
11. Edinburgh	132,297	4,104	6,008	22,709	5	65	144	33,215	5,458	11,722	46	1,200	313	384	19,103	81,501	47,825	81,501	47,825	81,501	47,825	81,501	47,825	81,501	
12. Elgin	101,474	886	14,141	20,421	603	62	12	36,125	1,678	15,433	68	18	415	6	17,623	39,456	8,221	39,456	8,221	39,456	8,221	39,456	8,221	39,456	
13. Fife	255,998	10,028	22,569	85,665	874	1,104	48	78,282	15,042	24,704	51	554	717	50	41,113	64,241	75,813	64,241	75,813	64,241	75,813	64,241	75,813	64,241	
14. Forfar	251,040	8,640	30,473	48,817	766	633	76	87,404	12,606	84,188	83	293	497	114	47,791	86,019	59,513	86,019	59,513	86,019	59,513	86,019	59,513	86,019	
15. Forth	111,817	5,162	18,340	18,151	96	491	83	88,929	7,750	10,652	251	567	263	388	24,791	38,029	19,669	38,029	19,669	38,029	19,669	38,029	19,669	38,029	
16. Haddington	149,011	96	7,594	30,948	638	8	22	88,278	6,071	10,652	17	56	108	25	16,980	30,219	63,810	30,219	63,810	30,219	63,810	30,219	63,810	30,219	
17. Inverness	190,590	798	19,958	27,180	59	588	43	43,600	2,584	17,923	5	36	394	101	21,013	47,832	9,487	47,832	9,487	47,832	9,487	47,832	9,487	47,832	
18. Kinross	85,387	492	6,261	59	28	3	6	6,846	618	9,705	1	17	65	18	3,668	11,827	13,095	11,827	13,095	11,827	13,095	11,827	13,095	11,827	
19. Kirkcubright	191,546	14	66	27,510	19	73	6	27,512	1,575	12,077	108	1,367	30	60	15,292	68,573	85,623	68,573	85,623	68,573	85,623	68,573	85,623	68,573	
20. Lanark	365,702	2,580	359	36,648	531	855	44	44,532	4,446	8,900	32	2,005	231	322	16,446	92,604	108,516	92,604	108,516	92,604	108,516	92,604	108,516	92,604	
21. Linlithgow	3,413	1,580	3,413	6,182	39	387	6	14,578	4,446	8,900	32	2,005	231	322	16,446	92,604	108,516	92,604	108,516	92,604	108,516	92,604	108,516	92,604	
22. Nairn	25,543	4	3,489	6,182	88	3	3	8,933	933	4,193	8	8	37	3	4,566	10,484	1,847	10,484	1,847	10,484	1,847	10,484	1,847	10,484	
23. Orkney	107,427	..	4,594	35,882	..	8	28	85,035	2,733	14,564	..	81	398	2	17,711	34,180	17,975	34,180	17,975	34,180	17,975	34,180	17,975	34,180	
24. Shetland	59,045	..	1,740	1,628	10	..	..	9,252	5,046	1,376	..	50	8	..	5,996	1,870	4,606	1,870	4,606	1,870	4,606	1,870	4,606	1,870
25. Peebles	49,426	24	436	8,636	..	..	..	8,517	3,32	4,092	..	520	63	..	5,068	7,709	17,900	7,709	17,900	7,709	17,900	7,709	17,900	7,709
26. Perth	358,737	5,764	19,460	68,731	378	2,098	87	87,613	12,884	29,538	110	465	383	69	45,364	69,018	105,745	69,018	105,745	69,018	105,745	69,018	105,745	69,018	
27. Renfrew	91,797	1,583	57	10,061	70	237	25	12,633	2,994	2,386	40	434	22	49	5,916	23,687	43,842	23,687	43,842	23,687	43,842	23,687	43,842	23,687	
28. Rose & Cromarty	141,248	789	12,707	29,868	796	105	48	44,308	7,405	10,428	116	163	468	5	24,560	43,583	27,766	43,583	27,766	43,583	27,766	43,583	27,766	43,583	
29. Roxburgh	182,281	488	19,224	28,740	16	165	37	42,610	1,375	21,679	54	104	273	15	24,440	32,912	62,863	32,912	62,863	32,912	62,863	32,912	62,863	32,912	
30. Salak	90,140	8	4,441	4,980	116	2,817	16	6,345	197	2,697	..	156	57	1	3,107	9,183	12,587	9,183	12,587	9,183	12,587	9,183	12,587	9,183	
31. Stirling	118,921	1,821	5,255	27,797	86	1	24	26,818	3,252	4,839	18	282	260	61	8,266	81,506	11,930	81,506	11,930	81,506	11,930	81,506	11,930	81,506	
32. Strathclyde	32,769	..	1,371	7,817	86	1	24	9,299	1,668	3,082	..	8	26	3	4,782	8,608	9,975	8,608	9,975	8,608	9,975	8,608	9,975	8,608	
33. Wigtown	164,538	368	3,747	49	251	3	3	34,414	1,490	15,102	900	407	70	132	17,501	67,947	84,507	67,947	84,507	67,947	84,507	67,947	84,507	67,947	
Total	4,890,256	43,832	340,136	949,128	5,998	18,124	1,872	1,758,649	131,200	465,284	2,601	18,978	9,686	2,494	625,955	1,504,486	1,408,119	1,504,486	1,408,119	1,504,486	1,408,119	1,504,486	1,408,119	1,504,486	1,408,119

TABLE NO. 2. ESTIMATED TOTAL PRODUCE OF WHEAT, BARLEY, AND OATS, ACREAGE AND ESTIMATED AVERAGE YIELD per Acre in the Year 1899 compared with the Estimated Yield for the Years 1898 and 1897, and the AVERAGE of the Ten Years, 1889-98, in each COUNTY, SCOTLAND.

COUNTIES.	WHEAT.					BARLEY, INCLUDING BEER.					OATS.				
	Total Produce in 1899.	Acreage in 1899.	Average Yield per Acre		Average of the Ten Years, 1889-98.	Total Produce in 1899.	Acreage in 1899.	Average Yield per Acre		Average of the Ten Years, 1889-98.	Total Produce in 1899.	Acreage in 1899.	Average Yield per Acre.		Average of the Ten Years, 1889-98.
			1899.	1897.				1899.	1897.				1899.	1897.	
Aberdeen	130	4	30.00	34.33	32.60	975,866	29,415	33.28	34.24	37.32	6,448,127	184,478	34.95	38.99	35.07
Argyll	200	5	40.00	38.74	37.15	47,401	1,726	27.46	30.56	31.31	2,133,028	17,926	30.65	32.31	30.85
Ayr	47,585	1,197	37.75	38.74	37.88	68,091	1,634	41.67	41.59	37.30	531,028	17,926	47.58	46.14	48.01
Banff	863	24	35.96	37.86	33.78	359,889	10,504	34.31	38.36	37.85	1,651,053	46,874	35.22	39.28	35.11
Berwick	75,214	2,120	35.48	39.37	33.95	742,042	21,143	35.10	41.31	36.62	1,178,161	33,375	35.30	39.55	39.24
Bute	442	12	36.83	38.96	38.67	3,461	85	40.72	40.88	40.84	4,954	4,954	34.61	39.58	37.54
Cathness	16	1	16.10	16.20	15.10	35,378	1,257	28.14	31.60	21.91	990,784	33,066	29.35	33.41	33.85
Clackmannan	8,558	214	39.99	42.12	42.59	18,568	591	31.40	37.32	38.41	117,837	3,021	39.01	44.31	45.45
Dumbaron	35,657	978	36.46	41.46	38.26	9,980	266	40.37	43.04	42.09	253,668	6,842	37.07	42.23	39.88
Dumfries	5,610	143	39.51	41.48	38.26	32,971	631	39.88	39.83	35.11	1,450,733	45,370	33.45	35.86	34.13
Dunblane	179,091	4,158	43.07	49.14	43.55	237,375	5,904	40.90	43.30	42.55	841,506	26,213	36.89	42.98	42.72
Edinburgh	45,729	1,209	37.82	40.74	40.58	18,568	591	31.40	37.32	38.41	117,837	3,021	39.01	44.31	45.45
Elgin or Moray	311,471	9,470	33.60	42.39	34.46	711,406	22,475	32.42	37.99	37.06	1,853,650	58,732	34.96	41.13	42.53
Fife	313,546	8,572	36.81	40.64	37.98	1,094,320	30,095	36.36	40.68	36.04	1,802,668	47,858	37.67	39.09	44.31
Forfar	215,168	5,087	43.30	45.35	38.74	672,162	19,882	41.03	47.68	40.87	688,362	17,814	39.76	43.07	44.90
Glasgow	56,430	5	24.0	31.38	30.77	190,307	7,502	25.37	28.58	28.33	896,855	30,051	29.84	32.06	30.85
Haddington	120	5	24.0	31.38	30.77	190,307	7,502	25.37	28.58	28.33	896,855	30,051	29.84	32.06	30.85
Inverness	26,631	692	38.48	41.08	38.78	495,392	13,520	36.64	39.18	38.32	1,099,286	27,517	39.95	42.02	40.82
Kilnass	1,098	82	32.37	39.65	38.00	1,453	366	31.60	33.10	35.95	170,125	5,297	27.02	32.22	33.63
Kirkcubright	3,588	104	34.50	37.24	35.37	1,949	406	37.66	34.44	35.82	1,371,651	38,511	34.11	38.33	33.75
Leven	74,992	2,184	37.40	37.26	33.38	187,448	3,498	38.04	35.06	40.79	1,274,489	38,511	34.11	38.33	33.75
Leithgow	51,597	1,298	39.81	40.09	41.10	39,712	1,298	39.81	40.09	41.10	39,712	1,298	39.81	40.09	41.10
Nairn	32	1	32.00	32.74	30.99	113,435	5,447	36.04	35.06	36.39	157,580	5,447	36.04	35.06	36.39
Orkney	216	30	86	82.46	37.69	151,223	4,600	33.53	30.78	33.15	937,215	33,690	28.47	28.90	28.17
Perth	106,947	5,104	35.59	43.97	40.66	548,520	15,988	35.90	38.73	34.27	2,180,283	64,553	33.78	38.50	37.37
Perthshire	65,521	1,687	35.84	38.62	37.60	2,255	57	45.35	42.94	40.13	482,695	11,249	42.90	42.62	43.05
Ross and Cromarty	24,550	813	30.20	36.23	37.98	400,678	12,855	31.17	35.76	36.98	921,617	29,685	31.05	36.25	36.99
Shetland	17,441	518	33.67	38.25	33.32	426,175	13,231	32.21	41.10	34.68	980,401	29,028	32.05	36.81	36.90
Selkirk	..	..	..	..	..	11,486	476	24.03	26.60	24.97	143,965	4,746	30.00	33.70	36.91
Shetland	..	..	..	..	..	59,973	7,005	26.45	35.04	36.97	182,901	7,292	25.08	23.82	31.10
Stirling	51,863	1,361	38.11	42.82	40.42	35,532	1,361	38.11	42.82	40.42	664,601	17,906	36.44	41.83	41.56
Sutherland	..	..	..	..	..	34,286	1,387	24.68	37.74	36.03	664,601	17,906	36.44	41.83	41.56
Wick	..	..	..	..	..	113,180	3,987	24.68	37.74	36.03	664,601	17,906	36.44	41.83	41.56
Wigtown	..	..	..	..	..	947	32.33	35.20	33.80	31.85	1,164,186	35,471	34.78	34.65	33.31
Total	1,795,390	47,256	37.42	42.47	37.83	8,222,891	240,496	34.19	39.07	36.63	34,313,304	957,873	34.78	36.87	36.60

† Average of 9 years only.

† Average of 8 years only.

* Average of 6 years only

TABLE NO. 5.—ESTIMATED TOTAL PRODUCE OF HAY FROM CLOVER, SAINFOIN, AND GRASSES UNDER ROTATION, ALSO TOTAL FROM PERMANENT PASTURE, AVERAGE, and Estimated AVERAGE YIELD per Acre in the Year 1899, compared with the Estimated YIELD for the Years 1898 and 1897, and the AVERAGE of the Ten Years, 1889-98, in each COUNTY OF SCOTLAND.

COUNTIES.	FROM CLOVER, SAINFOIN, AND GRASSES.				FROM PERMANENT PASTURE.			
	Total Produce in 1899.	Acres.	Average Yield per Acre		Total Produce in 1899.	Acres.	Average Yield per Acre.	
			1899	1897			1899.	1897.
	Cwt.		Cwt.	Cwt.			Cwt.	Cwt.
Aberdeen	1,227,074	45,137	27.19	27.37	12,263	662	18.52	22.01
Argyll	342,280	11,568	29.59	29.62	12,263	662	18.52	22.01
Ayr	1,091,438	31,377	33.83	36.37	13,498	662	22.58	22.01
Banff	296,173	9,062	24.96	32.87	62,604	16,344	38.91	27.53
Berwick	249,831	9,217	27.05	31.34	4,406	18,229	30.59	27.53
Bute	71,991	2,007	35.87	31.01	1,873	4,406	18.29	27.53
Caithness	169,601	9,341	18.16	34.90	10,643	3,664	29.24	31.01
Dumfriesshire	85,227	1,790	32.53	33.34	12,359	1,710	11.66	28.78
Dumfries	253,997	7,030	37.59	39.65	14,573	591	24.52	29.19
Dumfries & Galloway	693,121	17,006	40.72	39.65	1,465	95	15.58	29.19
Edinburgh	12,434	28.31	28.12	29.07	67,003	15,705	86.17	83.40
Elgin & Moray	126,443	28.31	28.12	29.07	15,705	1,705	85.01	83.40
Fife	727,417	25,812	29.73	31.40	3,581	1,197	18.18	29.19
Forfar	731,425	19,055	38.38	31.40	3,581	1,197	18.18	29.19
Glasgow	519,474	10,147	51.19	58.89	8,844	8,844	27.05	26.49
Haddington	212,873	11,861	18.69	56.07	33,345	1,167	20.00	23.43
Inverness	388,309	12,566	26.92	17.84	89,718	1,231	27.12	31.08
Kincardine	63,592	2,581	25.13	28.38	1,070	60	17.83	11.24
Kinross	246,416	9,010	27.35	27.30	27.30	60	17.83	11.24
Kirkcudbright	1,095,888	34,490	30.40	41.71	335,677	718	27.71	35.29
Leith	334,713	6,905	48.47	51.59	299,368	8,661	26.55	33.63
Linlithgow	170,073	8,872	19.17	15.91	19,456	654	31.10	27.26
Orkney	64,788	2,126	30.47	15.41	4,483	30	29.75	30.82
Peebles	806,568	29,851	27.48	30.54	5,567	30	16.10	11.48
Perth	497,983	13,945	35.71	30.42	3,164	1,344	29.14	9.86
Renfrew	225,721	13,555	16.63	25.88	194,357	9,358	21.50	24.37
Ross and Cromarty	27,714	7,624	36.06	40.09	211,314	5,461	44.19	45.23
Salisbury	14,392	708	20.96	30.73	15,715	2,268	6.93	7.85
Shetland	428,462	12,642	33.89	38.65	1,506	6,932	21.40	25.81
Sutherland	82,895	4,186	19.09	27.37	205,096	1,506	17.36	16.85
Wigtown	149,810	4,603	32.97	32.97	104,408	8,292	81.89	33.78
Total	11,904,061	3,424	30.30	34.21	3,704,981	127,626	29.03	28.84

* This Average is less than that stated in some other Tables by 419 acres, which were originally returned for the county of Orkney as "Grass for Hay," but were subsequently stated to have been used for grazing.

TABLE NO. 6.—NUMBER OF HORSES, CATTLE, SHEEP, AND PIGS IN EACH COUNTY OF SCOTLAND AS RETURNED ON JUNE 4, 1900.

COUNTIES.	HORSES (including Ponies).				CATTLE.				SHEEP.			Pigs.
	Used solely for Agriculture, &c.	Unbroken Horses.		Total.	Cows and Heifers in Milk or in Calf.	Other Cattle.		Total.	1 Year Old and above.	Under 1 Year.	Total.	
		1 Year and above	Under 1 Year			2 Years and above	Under 2 Years					
1. Aberdeen	23,080	5,229	1,893	30,152	44,657	41,585	89,240	175,482	136,258	92,057	228,315	11,815
2. Argyll	4,418	1,176	423	6,015	22,795	12,728	23,377	60,900	652,452	283,885	936,337	4,020
3. Ayr	7,119	1,421	363	8,903	50,776	13,057	36,357	101,090	293,246	148,714	381,960	14,612
4. Banff	6,770	1,498	613	8,881	13,221	6,037	24,991	44,249	41,326	28,074	70,000	2,775
5. Berwick	4,466	705	165	5,336	2,930	4,987	8,870	16,787	161,998	151,164	313,162	3,043
6. Bute	957	182	46	1,185	8,756	4,160	4,594	13,454	30,768	46,588	77,379	589
7. Caithness	4,454	744	231	5,429	7,741	2,554	11,814	22,109	77,874	49,405	127,279	1,483
8. Clackmannan	510	97	21	628	8,468	706	1,352	3,516	8,094	4,782	12,876	1,660
9. Dumbarton	1,463	280	77	1,820	8,614	2,418	4,219	15,251	46,450	24,189	70,639	1,808
10. Dumfries	5,660	1,291	424	7,375	20,297	12,687	29,243	62,187	108,993	516,135	624,666	3,482
11. Edinburgh	3,772	428	183	4,383	11,877	8,731	11,972	20,080	108,993	73,674	182,666	2,511
12. Elgin	9,842	717	290	10,849	6,742	2,948	11,950	47,673	60,993	28,419	89,412	2,418
13. Fife	7,814	1,518	459	9,791	12,166	15,434	20,953	47,673	63,171	46,009	109,180	5,511
14. Forfar	8,447	1,116	379	9,942	12,166	17,784	20,987	50,080	101,688	60,580	162,268	6,675
15. Haddington	9,290	924	66	10,280	1,855	3,873	3,100	8,968	71,168	49,422	120,590	1,631
16. Inverness	7,097	1,070	645	8,812	22,276	6,641	22,763	51,520	418,669	187,681	606,350	2,419
17. Kincardine	4,069	634	245	4,948	6,802	5,990	12,661	25,333	35,601	17,637	53,238	2,456
18. Kinross	472	192	57	721	1,307	1,385	3,936	6,627	22,527	14,882	37,409	566
19. Kirkcubright	4,009	1,072	373	5,454	16,094	12,709	21,146	49,949	245,193	146,796	392,229	7,413
20. Lanark	6,945	1,112	366	8,423	39,681	11,181	23,473	78,335	156,561	89,084	245,665	6,709
21. Leithgow	1,951	349	68	2,368	4,907	3,131	4,177	12,215	15,374	6,721	22,095	1,761
22. Nairn	852	265	69	1,186	1,972	603	3,472	6,047	13,559	5,867	19,426	634
23. Orkney	3,550	852	454	4,856	8,894	3,192	14,977	28,056	18,506	17,383	35,769	2,807
24. Shetland	881	136	21	1,038	9,804	4,329	6,346	18,679	68,164	42,409	110,573	532
25. Peebles	10,013	1,724	446	12,183	17,890	1,868	3,616	7,124	114,470	82,829	196,799	7,212
26. Perth	2,642	500	111	3,253	16,831	5,075	6,249	26,155	24,631	15,441	40,072	1,178
27. Renfrew	6,116	1,281	486	7,883	17,834	6,840	18,676	43,550	205,704	101,552	307,256	4,245
28. Ross and Cromarty	3,710	422	100	4,232	4,587	4,422	8,642	17,851	288,389	292,071	580,460	3,001
29. Roxburgh	5,710	86	12	5,808	1,213	380	1,482	3,075	101,328	77,719	179,040	946
30. Selkirk	588	831	12	1,399	12,085	8,767	12,525	33,377	79,125	44,805	123,930	2,278
31. Stirling	2,359	831	230	3,420	5,712	1,559	4,806	12,077	141,696	62,771	204,467	816
32. Sutherland	2,281	265	88	2,634	5,712	1,559	4,806	12,077	141,696	62,771	204,467	816
33. Wigtown	4,329	1,101	443	5,878	24,038	8,034	18,411	50,483	79,751	48,188	127,939	10,621
Total	153,353	30,330	10,855	194,538	434,264	243,674	520,148	1,198,086	4,613,316	2,701,681	7,314,997	132,419

* Including Mares kept for breeding.

TABLE NO. 7.—QUANTITIES AND VALUES OF CORN, MEAT, FOOD PRODUCTS,
in the Year 1900, with the

[From Trade and

	Quantities.			Values.		
	1898.	1899.	1900.	1898.	1899.	1900.
ANIMALS, LIVING :—	No.	No.	No.	£	£	£
Cattle	569,066	503,504	495,184	9,899,793	8,572,114	9,004,529
Sheep and lambs	663,747	607,755	382,822	984,868	942,891	610,108
Swine	450	..	..	1,020	..	..
Total value . . . . .	..	..	..	10,885,676	9,515,005	9,614,637
CORN :—	Cwt.	Cwt.	Cwt.	£	£	£
Wheat	65,227,930	66,686,078	68,615,990	26,147,256	22,281,219	23,826,676
Wheat meal and flour	21,017,109	22,945,708	21,542,035	11,545,448	10,700,980	10,102,498
Barley	24,457,004	17,189,358	17,054,990	6,791,472	4,050,132	5,152,947
Oats	15,577,900	15,626,730	20,109,660	4,382,857	4,199,724	5,236,409
Peas	2,170,192	2,752,950	2,257,079	689,769	898,951	782,599
Beans	2,293,346	1,877,220	1,705,760	670,159	573,891	533,118
Maize	57,169,292	62,741,350	54,150,410	11,282,310	12,978,025	12,827,530
Maize-meal	1,453,800	1,814,766	1,638,505	879,485	457,584	456,449
Other kinds of corn } and meal }	..	..	..	1,020,513	1,047,236	1,003,284
Total value . . . . .	..	..	..	62,909,264	58,087,692	58,921,510
MEAT :—	Cwt.	Cwt.	Cwt.	£	£	£
Beef, salted	208,945	178,183	194,668	273,004	230,943	259,290
" fresh	3,100,821	3,502,893	4,128,150	5,915,705	7,345,264	8,163,348
Mutton, fresh	3,314,001	3,446,022	3,392,850	4,902,179	5,439,817	5,841,566
Bacon	5,711,322	5,804,583	5,641,248	10,321,674	10,399,802	11,773,069
Hams	1,972,299	1,978,626	1,802,670	3,894,839	4,094,500	4,221,817
Pork, salted (not } Hams) }	275,993	284,720	248,710	319,778	305,829	301,346
Pork, fresh	557,602	668,972	695,395	1,165,380	1,403,041	1,495,393
Meat, unenumerated } —salted or fresh }	414,977	464,759	530,614	812,738	883,349	982,025
Meat preserved } otherwise than by } salting }	574,937	652,421	804,471	1,802,440	1,895,716	2,383,510
Rabbits	314,398	377,311	473,167	572,603	638,655	730,437
Total of dead meat	16,445,295	17,658,490	17,911,923	29,980,340	32,630,216	36,152,710
DAIRY PRODUCE :—	Cwt.	Cwt.	Cwt.	£	£	£
Butter	3,209,153	3,889,851	3,878,516	15,961,783	17,213,516	17,450,482
Margarine	900,615	953,175	920,416	2,384,384	2,549,476	2,464,839
Cheese	2,330,452	2,384,069	2,711,805	4,970,242	5,503,004	6,853,317
Total	6,449,220	6,727,095	7,010,737	23,316,409	25,265,996	26,768,588
POULTRY, &c. :—				£	£	£
Poultry and game, } alive or dead }	..	..	..	637,492	785,294	1,010,337
Eggs	Gt. Hunds. 14,424,601	Gt. Hunds. 16,174,756	Gt. Hunds. 16,881,838	4,457,117	5,044,402	5,406,141
Total value . . . . .	..	..	..	5,094,609	5,829,696	6,416,468

AND ARTICLES AFFECTING AGRICULTURE, imported into the United Kingdom
Corresponding Figures for 1898 and 1899.

Navigation Returns.]

	Quantities.			Values.		
	1898.	1899.	1900.	1898.	1899.	1900.
FRUIT, &c. :—	Bushels.	Bushels.	Cwt.	£	£	£
Apples	3,458,716	3,861,172	2,128,477	1,108,066	1,186,148	1,224,655
Cherries	401,810	281,236	242,505	230,828	153,642	308,895
Plums	923,248	553,278	423,019	434,660	294,052	392,696
Pears	491,669	571,832	476,908	221,779	266,351	366,871
Grapes	1,185,759	1,157,647	592,337	549,513	588,467	505,000
Oranges and lemons .	8,905,956	10,242,216	6,038,267	2,426,245	2,685,471	2,541,646
* Unenumerated . . .	2,177,132	2,247,785	494,722	870,711	924,823	289,752
Onions	6,002,515	7,018,249	7,082,334	792,909	845,752	853,908
Potatoes	Cwt. 6,751,728	Cwt. 5,159,011	8,903,534	1,913,912	1,577,726	2,232,312
Vegetables, unenumerated (raw) }	..	..	..	1,680,786	1,744,068	760,394
Hops	244,136	180,233	198,494	1,030,140	809,842	795,470
Total value	..	..	..	11,259,545	11,026,837	10,367,124
OTHER ARTICLES :—	Cwt.	Cwt.	Cwt.	£	£	£
Lard	2,106,871	2,188,049	1,926,554	2,887,801	3,068,976	3,266,582
Wool, sheep and lambs' }	Lb. 694,701,454	Lb. 663,331,817	Lb. 553,154,712	23,536,901	23,714,771	21,836,184
Wood and timber -	Loads.	Loads.	Loads.			
Hewn	2,331,756	2,604,877	3,121,126	4,890,639	5,819,375	6,464,565
Sawn or split, planed or dressed }	6,363,357	6,639,548	6,633,281	15,056,040	16,209,551	18,686,539
Staves	139,120	126,216	145,279	646,075	659,312	722,460
Oilseed cake . . .	Tons. 390,753	Tons. 441,934	Tons. 394,889	2,284,244	2,649,184	2,547,535
Seeds—	Cwt.	Cwt.	Cwt.			
Clover and grass .	342,773	299,268	261,957	655,211	549,743	508,913
Cotton	Tons. 430,432	Tons. 358,012	Tons. 406,435	2,069,111	2,036,550	2,624,181
Flax and linseed .	Qrs. 1,688,615	Qrs. 1,798,887	Qrs. 1,668,881	2,920,634	3,383,962	4,170,748
Rape	258,951	207,648	134,214	367,736	307,053	246,620
Bones (whether burnt or not) . . .	Tons. 59,406	Tons. 68,915	Tons. 68,737	245,639	313,659	301,808
Guano	28,644	26,911	33,686	117,924	140,075	178,009
Cotton, raw . . .	Cwt. 19,004,896	Cwt. 14,520,062	Cwt. 15,736,172	34,125,554	27,672,399	41,027,181
Hemp	Tons. 94,442	Tons. 91,973	Tons. 106,097	2,308,480	2,664,647	.
Flax	97,253	99,052	71,588	2,932,646	2,927,564	2,509,810
Hides untanned—	Cwt.	Cwt.	Cwt.			
Dry	543,212	446,725	751,504	1,454,985	1,148,189	1,966,743
Wet	694,154	763,543	634,375	1,451,029	1,689,898	1,467,760
Petroleum	Gallons. 219,249,539	Gallons. 240,147,367	Gallons. 255,852,261	3,733,632	4,574,989	5,574,533

* Prior to 1900 "Fruit, Unenumerated (raw)," included Bananas, Currants, Gooseberries, and Strawberries.

TABLE NO. 8.—QUANTITY AND VALUE OF CORN, &c., imported into the United Kingdom in the undermentioned Years.

[From Trade and Navigation Returns]

	Quantities			Values		
	1898	1899	1900.	1898.	1899	1900.
Wheat from—	Cwt	Cwt	Cwt	£	£	£
Russia	6,282,500	2,618,201	4,421,500	2,540,388	840,789	1,605,947
Germany	711,990	466,080	1,825,900	302,155	152,104	599,702
Turkey	271,560	27,900	131,200	96,898	8,110	42,568
Roumania	183,700	32,100	756,100	76,544	11,050	262,548
United States—						
On the Atlantic	30,561,000	28,815,948	22,845,870	12,325,090	9,696,931	7,756,845
On the Pacific	7,294,200	6,334,700	10,242,000	2,909,676	2,115,369	3,470,923
Chile	807,900	265,300	2,500	380,252	84,120	868
Argentine Republic	3,933,400	11,868,000	18,524,000	1,753,904	3,622,063	6,068,923
British East Indies	9,537,900	8,192,200	9,400	3,556,001	2,651,167	3,281
Australasia	211,620	8,709,300	3,788,200	79,762	1,247,744	1,315,477
British North America	5,012,080	5,256,500	6,387,600	1,948,147	1,801,058	2,206,678
Other countries	421,330	156,170	226,720	166,394	50,419	73,421
Total	65,227,930	66,636,078	68,615,990	26,147,266	22,281,219	23,326,676
Wheat and flour from—						
Germany	107,340	60,707	6,154	51,378	25,561	15,997
France	438,160	641,839	755,445	224,371	275,181	324,122
Austrian territories	729,290	1,029,616	1,167,955	543,266	563,931	629,323
United States	17,445,890	16,405,796	17,871,807	9,470,433	8,563,884	8,366,256
British North America	1,968,200	2,498,920	1,195,219	1,057,927	1,154,246	570,680
Other countries	928,229	308,831	515,582	192,568	117,977	196,120
Total	21,017,109	22,945,708	21,422,035	11,545,443	10,700,980	10,102,498
Barley	24,457,004	17,189,358	17,054,990	6,791,472	4,950,132	5,162,047
Oats	15,577,900	15,626,780	20,109,660	4,882,357	4,199,724	5,256,409
Peas	2,179,192	2,732,950	2,257,079	689,769	898,951	782,599
Beans	2,298,346	1,877,220	1,705,760	670,169	573,891	568,116
Indian corn or maize	57,109,292	62,741,500	54,150,410	11,282,310	12,978,025	12,327,580
Indian corn meal	1,403,800	1,814,766	1,633,505	379,485	457,534	406,449
Other kinds of corn and meal				1,020,713	1,047,236	1,003,244
Total of corn, &c.				62,909,264	58,087,692	58,921,510

TABLE NO. 9.—RETURN OF THE AVERAGE PRICES OF WOOL in the Years 1898 and 1899

Years	Australian	South African	English Fleeces
	Per lb	Per lb	Per lb
	s d	s d	s d
1898	0 8½	0 7½	0 7½ to 0 9½
1899	0 9	0 7½	0 7 n 0 11

TABLE NO. 10.—QUANTITY AND VALUE OF DEAD MEAT imported into the United Kingdom in the undermentioned Years.

[From Trade and Navigation Returns.]

	Quantities.			Values.		
	1898.	1899.	1900.	1898.	1899.	1900.
	Cwt.	Cwt.	Cwt.	£	£	£
BACON, from—						
Denmark	1,017,520	1,210,612	1,094,826	2,701,112	2,945,757	3,056,782
Canada	555,879	453,773	529,864	995,625	761,881	1,075,445
United States	4,187,889	4,088,546	3,056,537	6,438,239	6,552,180	7,491,948
Other countries	70,584	51,652	60,221	186,698	189,804	147,760
Total	5,711,322	5,804,583	5,641,248	10,321,674	10,399,602	11,773,969
BEEF (salted), from—						
United States	208,645	175,056	185,229	286,660	226,842	244,851
Other countries	5,300	3,127	9,439	6,344	4,101	14,448
Total	208,945	178,183	194,668	273,004	230,943	259,299
BEEF (fresh), from—						
United States	2,301,956	2,756,458	2,867,238	4,677,431	5,711,525	6,059,776
Australia	624,407	74,648	724,658	958,338	1,124,912	1,168,268
Other countries	174,458	302,792	536,234	284,936	508,827	935,301
Total	3,100,821	3,802,898	4,128,130	5,915,705	7,345,264	8,163,348
HAMS, from—						
Canada	117,428	150,698	196,192	233,272	301,212	446,942
United States	1,851,520	1,823,965	1,602,453	3,651,414	3,781,007	3,762,714
Other countries	3,351	3,963	4,085	10,153	12,261	12,161
Total	1,972,299	1,978,626	1,802,670	3,894,839	4,094,500	4,221,817
MEAT (unenumerated, salted or fresh), from—						
Holland	249,939	254,001	266,412	517,507	526,271	564,863
United States	90,412	123,423	140,473	156,706	214,283	231,842
Other countries	74,626	87,335	123,729	135,625	142,796	165,820
Total	414,977	464,759	530,614	812,738	883,349	962,025
MEAT, preserved otherwise than by salting—						
Beef	261,344	366,349	516,529	1,017,480	1,063,636	1,457,171
Mutton	118,314	87,295	64,442	195,249	156,004	150,973
Other sorts	174,279	198,777	223,500	589,711	676,076	775,366
Total	574,937	652,421	804,471	1,802,440	1,895,716	2,383,510
MUTTON (fresh), from—						
Germany	1,270	608	1,193	2,315	1,503	2,826
Holland	265,543	284,886	331,320	584,779	629,040	737,520
Australasia	1,934,106	2,001,452	1,933,246	2,940,698	3,274,976	3,380,241
Argentine Republic	1,106,201	1,141,208	1,114,795	1,357,926	1,490,076	1,689,078
Other countries	6,879	17,868	12,296	15,961	43,722	31,892
Total	3,314,001	3,446,022	3,392,850	4,902,179	5,439,817	5,841,566
PORK (salted, not Bacon or Hams), from—						
United States	175,000	164,042	128,402	224,534	199,850	177,671
Other countries	100,993	120,678	120,305	95,244	105,979	123,675
Total	275,993	284,720	248,710	319,778	305,829	301,346
PORK (fresh), from—						
Holland	222,672	344,346	389,184	474,467	727,637	823,826
Belgium	85,102	85,842	51,527	88,258	91,996	127,006
Other countries	299,828	289,284	254,684	602,660	583,408	514,559
Total	557,602	688,972	695,395	1,165,385	1,403,041	1,465,393
RABBIT (dead), from—						
Belgium	84,505	80,988	58,874	228,876	216,659	161,155
Australia	204,938	266,543	397,185	275,235	342,121	494,050
Other countries	24,960	29,785	27,108	68,492	79,876	75,282
Total	314,398	377,311	473,167	572,603	638,655	730,487
Total of dead meat	16,445,295	17,658,490	17,911,923	29,980,340	32,636,216	36,152,710

TABLE NO. 11.—QUANTITIES AND VALUES OF BUTTER, MARGARINE, CHEESE, AND EGGS imported into the United Kingdom in each Year from 1898 to 1900 inclusive.

[From Trade and Navigation Returns.]

	Quantities			Values		
	1898.	1899.	1900.	1898.	1899.	1900.
BUTTER from—	Cwt.	Cwt.	Cwt.	£	£	£
*Russia . . .			209,738			980,770
Sweden . . .	294,982	245,599	196,041	1,501,668	1,246,137	1,013,775
Denmark . . .	1,465,080	1,430,052	1,486,842	7,359,831	7,553,436	8,029,622
Germany . . .	41,231	36,953	36,042	214,046	186,573	190,820
Holland . . .	269,324	284,810	282,805	1,329,488	1,417,641	1,414,441
France . . .	416,821	353,942	322,048	2,183,845	1,908,848	1,785,504
New S Wales . .	34,391	43,561	81,486	167,618	215,274	394,415
Victoria . . .	124,223	211,744	264,603	605,611	1,051,358	1,296,438
New Zealand . .	69,949	111,639	163,871	338,400	543,367	784,054
Canada . . .	156,865	250,083	133,313	661,935	1,113,956	640,760
United States . .	66,712	159,137	56,046	285,309	704,061	247,724
Other countries	269,645	262,331	141,231	1,314,082	1,272,865	672,109
Total	3,209,153	3,380,851	3,378,516	15,961,783	17,213,516	17,450,432
MARGARINE from—	Cwt.	Cwt.	Cwt.	£	£	£
Norway . . .	8,477	8,278	8,430	22,799	22,654	23,100
Holland . . .	844,177	897,806	862,154	2,209,809	2,379,044	2,295,174
France . . .	30,299	29,675	26,567	105,309	103,609	91,189
Other countries	17,662	17,416	23,245	46,467	14,709	55,376
Total	900,615	953,175	920,416	2,384,384	2,549,476	2,464,839
CHEESE from—	Cwt.	Cwt.	Cwt.	£	£	£
Holland . . .	292,925	328,541	327,817	724,936	810,015	800,619
France . . .	33,086	34,307	35,110	94,102	103,159	108,065
Australasia . .	44,608	32,284	86,513	91,161	72,318	232,872
Canada . . .	1,432,181	1,337,198	1,511,872	2,943,725	3,014,211	3,799,223
United States . .	435,995	590,737	680,583	1,006,586	1,380,609	1,740,749
Other countries	50,657	60,992	69,910	109,732	122,692	171,789
Total	2,339,452	2,384,069	2,711,805	4,970,242	5,503,004	6,853,317
EGGS from—	Great Hundreds	Great Hundreds	Great Hundreds	£	£	£
Russia . . .	3,645,903	4,318,801	4,024,712	966,129	1,183,031	1,109,553
Denmark . . .	2,019,508	2,266,030	2,438,858	685,447	808,543	923,551
Germany . . .	2,821,128	3,454,986	3,513,988	788,844	966,641	1,016,719
Belgium . . .	2,349,962	2,457,558	2,375,983	730,898	759,250	738,453
France . . .	2,115,096	2,288,553	2,276,850	817,836	867,875	863,133
Canada . . .	745,355	646,867	807,702	251,710	233,693	288,945
Other countries	727,649	742,156	1,443,745	216,753	225,369	465,787
Total	14,424,601	16,174,756	16,881,838	4,457,117	5,044,402	5,406,141

* Not shown separately prior to 1900

TABLE NO. 12.—PRICES OF LIVE STOCK IN 1897, 1898, AND 1899, as returned under the Markets and Fairs (Weighing of Cattle) Act, 1891.

[From Journal of the Board of Agriculture.]

NUMBER OF ANIMALS REPORTED AS ENTERING THE 19 SCHEDULED PLACES IN GREAT BRITAIN, TOGETHER WITH THE NUMBERS WEIGHED AND THE NUMBERS PRICED.

ANIMALS.	1899.*	1898.*	1897.
CATTLE :—	No	No	No
Entering markets	1,236,091	1,263,991	1,115,183
Weighed	139,482	138,652	111,767
Prices returned	124,552	124,197	100,371
Prices returned with breed and quality distinguished }	103,613	102,299	78,329
SHEEP :—			
Entering markets	4,681,602	4,691,619	4,194,310
Weighed	48,643	49,953	41,969
Prices returned with breed and quality distinguished }	42,154	40,460	36,692
SWINE :—			
Entering markets	455,056	363,370	211,613
Weighed	2,205	1,614	2,333
Prices returned	2,070	1,437	1,368
Prices returned with quality dis- tinguished }			

CALCULATED AVERAGE PRICE PER LIVE CWT IN TWELVE SELECTED PLACES.

(Obtained by dividing the total price by the total weight of the weighed animals of all descriptions in each of the three qualities or grades.)

PLACES	Inferior or third quality		Good or second quality		Prime or first quality	
	1899.	1898.	1899.	1898.	1899.	1898.
	Per cwt s d	Per cwt s d	Per cwt s d	Per cwt s d	Per cwt s d	Per cwt s d
ENGLAND :—						
Carlisle	26 10	25 10	30 8	29 10	34 6	32 10
Leeds	28 0	28 0	28 10	29 4	32 2	32 0
Liverpool	24 6	24 0	30 0	28 0	33 6	31 10
London	26 4	25 2	33 8	32 4	38 0	36 6
Newcastle	28 4	26 0	32 8	29 10	36 2	33 4
Shrewsbury	28 2	24 6	31 2	29 8	34 10	34 2
SCOTLAND :—						
Aberdeen	25 4	23 10	33 2	31 8	36 10	34 8
Dundee	26 4	26 10	32 10	31 4	35 2	33 8
Edinburgh	30 0	28 10	34 6	32 8	36 6	34 0
Falkirk	29 4	28 2	33 2	31 10	35 2	34 0
Glasgow	31 8	31 0	33 0	32 2	35 4	33 10
Perth	30 2	30 2	33 0	32 4	35 6	34 8

* Includes the returns from Carlisle and Falkirk.

TABLE NO. 13.—NUMBER AND VALUE OF LIVE CATTLE SHEEP, AND SWINE imported into the United Kingdom in the undermentioned Years [*From Trade and Navigation Returns.*]

	Number			Value		
	1898.	1899	1900.	1898.	1899.	1900
CATTLE, from—				£	£	£
Channel Islands	1,814	1,782	1,826	34,785	33,101	33,845
Canada	108,405	94,660	104,328	1,774,760	1,596,097	1,798,578
United States	869,475	821,929	850,209	6,288,984	5,541,781	6,500,744
Argentine Republic	89,369	85,965	88,662	1,351,264	1,392,509	667,500
Other countries		518	209		9,536	3,667
Total	569,066	503,504	495,134	9,399,799	8,572,114	9,004,529
SHEEP AND LAMBS, from—						
Canada	42,070	61,990	35,663	63,256	100,320	56,240
United States	147,021	121,090	142,905	219,706	184,446	224,841
Argentine Republic	430,073	382,080	178,969	697,885	598,456	289,000
Other countries	44,583	40,715	25,285	64,483	59,680	40,027
Total	663,747	607,755	382,822	984,869	942,891	610,108
SWINE (not separately enumerated)	450			1,020		
TOTAL VALUE OF ANIMALS LIVING				10,385,678	9,515,005	9,614,637

TABLE NO. 14.—NUMBER OF HORSES, CATTLE, SHEEP, AND PIGS imported into Great Britain from Ireland in each of the Years 1894 1900

	1894	1895	1896.	1897.	1898.	1899	1900
HORSES —							
Stallions	163	188	191	153	150	122	109
Mares	14,484	15,370	18,046	17,590	16,200	19,538	16,320
Geldings	18,942	19,002	21,619	20,679	20,454	22,562	19,183
Total	33,589	34,560	39,856	38,422	36,804	42,222	35,616
CATTLE Oxen, Bulls, and Cows—							
Fat	330,748	302,555	274,472	259,173	278,770	278,220	275,450
Store	422,534	414,859	349,800	419,302	460,903	443,456	427,891
Other cattle	7,805	5,622	3,837	5,048	4,101	6,219	7,442
Calves	65,867	68,571	53,451	62,404	59,588	45,099	34,736
Total	826,954	791,607	681,560	746,012	803,362	772,994	745,519
SHEEP —							
Sheep	574,471	351,975	397,164	435,709	449,858	452,214	478,081
Lambs	382,630	300,608	340,142	368,306	389,900	429,664	384,182
Total	957,101	652,578	737,306	804,515	839,458	875,575	862,263
PIGS —							
Fat	515,647	500,700	574,077	653,459	556,729	6,0850	678,847
Store	99,320	46,520	35,912	41,845	82,062	37,710	41,855
Total	584,967	547,220	610,589	695,307	638,785	688,660	715,202

EDINBURGH CORN-MARKET GRAIN TABLES for WHEAT, BARLEY, OATS, and BEANS, showing the Quantity offered for Sale, the Quantity Sold, the Highest, Lowest, and Average Prices, also the Bushel weights of the Highest and Lowest Prices of each kind of Grain for every Market-day, likewise the Results for every Month, and the final Result for the year 1900.

WHEAT

Date	Quantity offered for Sale	Quantity Sold	Highest Price	Lowest Price	Average Price	Table of Bushel weights for			
						Highest Price		Lowest Price	
	Imp qr	Imp qr	s d	s d	s d	1b	1b	1b	1b
1900									
Jan									
3	162	162	28 6	26 6	28 0		68		62
10	449	377	27 9	26 6	27 3		63		63
17	447	285	27 3	25 0	26 3		63	61	63
24	678	391	28 0	25 0	26 6		63		61½
1	586	418	28 0	23 6	26 4		63		63
	2,322	1 631	27 11	25 4	26 9				
Feb									
7	621	591	27 6	26 0	26 7		63	62	63
14	918	686	27 6	24 0	26 7		63		63
21	797	74	27 6	25 6	26 8		6		62
28	701	609	27 0	25 6	26 4		63		62
	3 0 7	2 440	27 3	2 1	26 6				
March									
7	440	400	27 3	23 0	25 1		63½		63
14	477	352	27 0	24 6	26 3		63		63
21	186	186	28 6	25 0	26 8		64		63
28	264	194	27 0	24 1	26 4		63		63
	1,977	1 132	27 5	24 3	26 2				
April									
4	440	440	28 6	26 6	27 1		64		63
11	384	365	29 0	26 6	28 4		63		62
18	353	252	29 0	26 0	28 5		63		63
2	772	197	28 1	26 0	27 11		64½		63
	1,954	1,754	28 11	26 2	28 0				
May									
2	1 300	890	28 6	25 6	27 5		63		63
9	965	504	28 0	26 3	27 0		63 64½		63
16	776	556	27 9	26 0	26 9		63		63
23	1 097	712	28 0	22 6	26 11		65		58½
30	1,244	459	27 0	25 9	26 6		63 65		63
	5,382	8 791	27 6	25 6	26 11				
June									
6	1,846	1,508	27 6	20 0	26 3		65½		56½
13	1 578	1 246	27 3	23 6	27 0		63 64		59½
20	1,140	765	28 6	23 6	27 6		63 64		63
27	1 083	418	29 6	24 0	28 10		63	61	62
	5,592	3,937	27 9	23 0	27 0				
July									
4	915	760	29 0	24 0	28 2		63 64		63
11	614	514	24 9	25 0	28 1		64½		63
18	262	251	29 0	25 6	27 4		63½		63
25	455	455	29 0	25 6	27 10		65½		63
	2,246	1,980	29 1	25 5	28 0				

WHEAT—continued.

Date	Quantity offered for Sale	Quantity Sold	Highest Price	Lowest Price	Average Price	Table of Bushel weights for			
						Highest Price		Lowest Price	
1900	Imp qr	Imp qr	s d	s d	s d	1b	1b	1b	1b
Aug									
1	819	889	29 6	28 0	28 7	64½	63	64½	
8	745	605	81 0	26 6	29 7	65½		80	
15	601	556	30 6	29 3	29 11	63½	64	63	
22	449	162	30 6	28 6	29 8	64		62	
29	209	42	29 6	27 0	28 10	63		60	62
	2,823	1,954	30 4	28 1	29 4				
Sept									
5	315	200	30 6	27 0	29 5	63		62	
12	300	138	30 3	28 0	29 1	63		61	
19	275	155	31 0	27 6	28 9	63		60	
26	410	220	31 0	25 9	28 2	64		59½	
	1 800	713	30 8	27 3	28 10				
Oct									
8	441	130	33 0	27 0	28 5	62½	63	61	
10	563	309	34 0	24 9	26 8	63½		61½	
17	1 1	444	32 0	25 0	28 6	63		58½	
24	1 019	252	34 0	24 6	29 5	61	61½	60	62
31	1,920	415	33 6	24 6	28 6	61		60	
	4,588	1,610	33 6	25 7	28 8				
Nov									
7	1 147	168	30 0	24 0	26 0	62	63	60½	
14	918	58	32 0	24 0	25 9	63		60½	62
21	737	463	28 0	24 6	27 11	63		59½	61½
28	585	205	26 6	24 0	25 2	63		59½	61½
	3 487	1 619	28 6	24 2	25 9				
Dec									
5	294	214	27 0	24 6	25 9	63		61	
12	441	441	28 0	23 0	25 6	62		61½	
19	342	310	30 0	25 0	27 0	63		58½	
26	452	117	30 0	25 0	26 9	63		61½	
	1 529	1,282	29 6	23 11	26 3				
Result for year	35,587	23,845	28 7	25 7	27 3				

BARLEY

1900							
Jan							
3	1,327	773	29 0	24 8	27 0	56	55
10	1,965	1,305	29 0	21 0	26 11	56	50
17	2,236	1,005	29 6	24 6	26 7	56	51
24	2,104	1,064	28 6	24 0	26 9	56	56
31	1,791	579	29 6	22 8	25 11	56	56
	9,423	4,726	29 1	23 8	26 9		
Feb							
7	1,883	914	29 6	23 9	26 7	56	56
14	2,308	1,014	28 0	24 6	26 4	56	56
21	1,901	818	28 0	23 6	25 9	56	55
28	1,426	908	28 6	23 6	26 0	56	56
	7,608	3,654	28 4	23 11	26 2		

BARLEY—continued.

Date	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price	Average Price	Table of Bushel weights for			
						Highest Price		Lowest Price	
1900						1b	1b	1b	1b
March	Imp qr	Imp qr	s d	s d	s d				
7	1,487	691	80 0	22 6	26 3		56		54
14	1,354	670	80 6	24 6	26 4		56		56
21	1,284	544	29 0	24 6	26 10	56	56½		55
28	1,310	615	29 0	25 6	27 0		56		54
	5,385	2,520	29 2	24 8	26 7				
April									
4	901	580	28 0	25 0	26 6		56		56
11	539	397	28 0	25 0	26 7		56	55	56
18	437	950	28 0	25 9	27 1		56		55
25	101	76	28 6	26 6	27 3		56		56
	1,968	1,353	28 1	25 4	26 8				
May									
2	188	40	27 0		27 0		56		
9	425	806	27 6	25 9	26 6	56	57		56
16	576	289	27 0	26 0	26 4		56		56
23	270	167	27 6	26 0	27 2		56		56
30	212	20	26 0		26 0		56		
	1,671	822	27 3	26 0	26 7				
June									
6	167	27	26 8		26 9		56		
18	220								
20									
27	367	27	26 3		26 9				
July									
4	35	10	25 6		25 6		56		
11	25	25	25 6		25 6		56		
18									
25	60	35	25 6		25 6				
Aug									
1	50								
5	120								
15	60	60	26 0	24 9	25 0		56		56
22	10	10	25 0		25 0		55		
29									
	240	70	25 6	24 9	25 0				
Sept									
5	1,690	935	27 6	21 0	25 8		56		57
12	1,420	888	27 0	22 6	24 4		55		5
19	3,396	2,797	27 0	22 0	24 9		56		59
26	3,024	1,878	26 3	22 0	25 0		56		53
	9,530	6,498	26 8	21 9	24 11				
Oct									
8	2,354	1,715	25 9	21 6	21 2		56		52
10	1,809	471	26 0	21 0	23 4		55		53
17	1,604	1,183	26 0	22 6	24 1		56		52½
24	1,116	425	26 0	22 0	24 1		56	52½	58
31	1,763	725	26 0	19 0	23 11		56		59
	8,546	4,519	25 11	21 3	24 0				

BARLEY—continued.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel-weights for		
						Highest Price.		Lowest Price.
1900	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	1b.	1b.	1b. 1b.
Nov.								
7	2,550	1,216	25 6	21 0	23 7	54	56	55
14	2,022	793	26 0	20 0	23 11		56	52½
21	2,215	1,458	25 0	22 0	23 8	55	56	54
28	2,141	1,323	26 0	20 0	23 11		56	51½
	8,923	4,790	25 6	21 1	23 9			
Dec.								
5	2,784	2,219	27 0	20 0	23 7		56	52½
12	2,024	1,449	27 0	18 0	23 10		56	51½
19	1,708	1,272	25 6	21 6	23 8	55	56	55
26	1,181	693	26 6	20 0	23 11		56	53½
	7,647	5,633	26 0	20 0	23 8			
Result for year	61,293	34,647	26 11	23 4	23 1			

OATS.

1900								
Jan.								
3	1,634	915	20 6	15 6	18 4		44½	40½
10	1,952	900	20 3	15 6	18 6	44	45	40 ½
17	2,329	1,324	22 0	16 9	18 6		45½	41
24	2,321	1,560	23 0	17 0	19 2		44½	41½
31	2,307	1,235	22 9	16 3	18 9		44½	42
	10,543	5,934	21 1	16 7	18 9			
Feb.								
7	2,570	1,546	22 6	15 9	18 6		44½	40½
14	2,634	2,142	23 0	16 3	19 3		44½	40
21	2,331	1,163	22 6	17 6	19 0		44½	41 ½
28	2,583	1,481	24 0	16 0	19 11		45½	41
	10,068	6,832	22 11	16 11	19 2			
March								
7	2,981	1,575	23 6	17 6	20 1		44½	40½ ½
14	3,166	1,926	24 6	17 9	20 6		45½	41 ½
21	2,551	1,201	24 6	17 6	21 8		44½	40
28	2,113	1,230	24 6	17 9	21 1		42½	41
	10,811	5,932	24 5	17 7	20 8			
April								
4	2,089	841	24 6	17 0	21 6		44½	41 ½
11	1,474	740	24 0	17 7½	20 10		44	40
18	624	367	25 0	18 0	22 3		44½	39½
25	1,645	552	25 0	19 0	21 6		44	42
	5,832	2,500	24 9	17 10	21 5			
May								
2	1,104	671	25 0	20 0	22 6	44	45	42
9	1,323	714	26 0	21 0	22 8		45½	42
16	1,368	563	25 3	20 6	22 6		45½	42
23	1,330	606	25 6	21 0	23 5		44½	40½
30	1,223	753	25 0	19 0	23 2	45½	46	37½
	6,398	3,807	25 2	20 4	22 10			

OATS—continued.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel- weights for	
						Highest Price.	Lowest Price.
1900	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	lb. lb.	lb. lb.
June							
6	1,287	482	25 9	21 0	23 6	44½	42
18	1,481	511	25 0	21 6	23 6	44½	42
20	1,500	525	24 9	21 0	23 8	48½ 44½	41
27	1,082	446	25 0	21 6	22 10	44½	42 48
	5,250	1,964	25 0	21 8	23 8		
July							
4	1,058	528	26 0	21 0	24 1	45½	42
11	820	468	24 6	21 6	23 0	43½	42 42½
18	584	314	26 0	20 0	23 9	44½	42
25	484	320	26 0	22 0	23 9	44½	42
	2,846	1,625	25 7	21 6	23 8		
Aug.							
1	895	732	27 6	28 6	25 0	44½	41 42
8	1,118	554	27 9	22 0	25 11	44	41
15	1,078	479	27 9	22 6	25 9	45	42
22	1,081	556	28 0	22 0	24 11	45½	42
29	690	560	27 0	20 0	22 5	43½	43
	4,857	2,861	27 7	22 6	24 10		
Sept.							
5	1,512	1,034	26 0	18 6	20 10	42	42
12	2,268	1,507	23 6	18 0	20 3	44	42
19	1,938	1,463	24 0	18 0	20 2	43	42
26	1,635	1,468	23 6	16 0	20 1	42	38
	7,353	5,472	28 8	18 1	20 4		
Oct							
3	1,843	1,195	23 6	17 3	20 1	44½	38½
10	1,876	824	27 0	18 0	20 1	44	41
17	1,206	1,137	26 0	15 6	20 6	42	39
24	1,199	815	22 6	16 6	20 4	43½	40
31	1,269	751	28 0	16 0	20 0	42½	41
	6,955	4,722	24 4	16 9	20 3		
Nov.							
7	2,080	1,357	28 6	16 0	20 2	46½	40
14	1,683	1,003	26 6	16 0	20 8	42	42
21	1,515	683	22 6	17 6	19 11	44½	42½
28	1,411	702	22 0	17 8	19 11	43½	40
	6,694	3,745	25 1	16 10	20 1		
Dec.							
5	1,515	842	28 0	15 0	19 4	44 44½	39
12	1,428	662	23 6	17 6	20 6	43½	40 41
19	2,008	1,055	21 6	15 0	18 9	44	37½ 39
26	1,416	440	21 0	16 6	19 4	43½ 44½	41
	6,867	3,019	22 3	16 2	19 5		
Result for year	83,974	47,418	24 8	18 8	20 8		

BEANS—continued.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel- weights for	
						Highest Price.	Lowest Price.
1900							
Sept.	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	lb. lb.	lb. lb.
5	..	..	..	..	..	..	..
12	..	..	..	..	..	..	..
19	..	..	..	..	..	..	..
26	..	..	..	..	..	..	..
	—	—	—	—	—		
Oct.							
5	..	..	..	..	..	..	..
10	36	..	..	..	..	..	..
17	..	..	..	..	..	..	..
24	..	..	..	..	..	..	..
31	20	..	..	..	..	..	..
	—	—	—	—	—		
Nov							
7	20	..	..	..	..	..	..
14	..	..	..	..	..	..	..
21	..	..	..	..	..	..	..
28	..	..	..	..	..	..	..
	—	—	—	—	—		
Dec.							
5	.	..	.	.	.	..	..
12	.	..	..	..	..	..	..
19	..	..	..	..	..	..	..
26	..	..	..	..	..	..	..
	—	—	—	—	—		
Result for year }	1,975	650	32 3	31 0	31 5		

PRICES OF SHEEP SINCE 1818.

TABLE No. 1.—CHEVIOT SHEEP.

Year.	Wethers.				Ewes.				Lambs.						
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.			
1818	28	0	to	30	0	not quoted.			8	0	to	10	0		
1819	25	0	"	27	0	15	0	to	17	0	10	6	"	12	0
1820	20	0	"	25	0	16	0	"	17	0	10	0	"	11	0
1821	18	0	"	20	0	14	0	"	16	0	7	6	"	8	0
1822	12	6	"	18	0	8	0	"	8	6	4	6	"	0	0
1823	18	6	"	18	0	7	0	"	10	6	5	6	"	6	0
1824	14	0	"	19	0	7	0	"	9	0	4	6	"	6	0
1825	29	0	"	32	0	15	0	"	19	0	9	0	"	10	6
1826	17	6	"	21	6	18	6	"	15	0	7	0	"	7	6
1827	15	0	"	24	0	not quoted			7	0	"	8	0		
1828	18	0	"	27	6	12	0	to	15	0	7	0	"	8	8
1829	18	0	"	24	0	12	6	"	14	0	7	0	"	8	6
1830	15	0	"	21	0	8	0	"	11	0	6	0	"	6	9
1831	18	0	"	25	0	9	0	"	13	0	7	0	"	8	0
1832	19	0	"	24	0	11	0	"	16	0	7	0	"	9	0
1833	22	0	"	31	0	13	6	"	20	0	8	0	"	11	8
1834	22	0	"	31	0	13	6	"	21	0	9	0	"	11	6
1835	22	0	"	27	6	18	0	"	20	6	8	0	"	11	0
1836	24	0	"	31	6	16	0	"	19	0	10	0	"	14	0
1837	19	0	"	28	0	14	0	"	19	0	10	0	"	13	0
1838	23	0	"	30	6	17	0	"	22	0	12	0	"	14	0
1839	23	0	"	31	0	14	0	"	19	0	0	0	"	13	0
1840	24	0	"	33	0	15	0	"	23	0	7	0	"	11	6
1841	23	0	"	30	0	14	0	"	22	0	8	0	"	12	0
1842	22	6	"	28	0	13	0	"	17	0	7	6	"	10	0
1843	19	0	"	25	0	8	0	"	12	0	5	0	"	8	0
1844	21	0	"	29	0	10	0	"	16	0	8	0	"	10	6
1845	23	0	"	33	0	13	0	"	20	0	8	0	"	13	0
1846	24	0	"	33	6	14	6	"	21	6	10	0	"	14	6
1847	24	0	"	35	0	13	0	"	24	0	11	6	"	15	0
1848	23	0	"	34	6	19	0	"	28	0	11	6	"	15	0
1849	21	0	"	30	2	12	0	"	21	0	0	0	"	14	0
1850	20	6	"	29	6	12	0	"	20	0	8	0	"	13	0
1851	21	6	"	31	0	13	0	"	21	0	8	9	"	14	0
1852	21	0	"	32	0	15	0	"	23	0	8	0	"	14	0
1853	26	6	"	38	0	17	0	"	28	6	9	0	"	17	0
1854	25	0	"	36	0	17	0	"	26	0	9	0	"	16	6
1855	23	6	"	36	0	16	0	"	25	0	10	0	"	17	0
1856	22	0	"	35	6	15	6	"	24	0	10	0	"	15	0
1857	24	0	"	36	0	14	6	"	26	0	10	6	"	14	6
1858	24	0	"	34	6	14	0	"	24	6	10	6	"	14	0
1859	25	0	"	34	6	16	0	"	25	0	10	3	"	14	9
1860	26	0	"	38	0	17	6	"	27	6	12	6	"	17	6
1861	25	0	"	38	6	16	0	"	28	0	9	0	"	16	0
1862	27	0	"	37	6	17	6	"	28	0	10	0	"	16	0
1863	25	0	"	38	6	19	0	"	28	6	10	6	"	16	0
1864	31	0	"	41	0	21	0	"	31	6	14	0	"	18	0
1865	32	6	"	44	0	22	6	"	33	6	14	6	"	20	0
1866	37	0	"	50	0	29	0	"	42	6	15	0	"	26	0
1867	26	0	"	58	0	18	0	"	25	6	12	0	"	16	0
1868	30	0	"	32	0	15	6	"	21	0	7	6	"	13	0
1869	28	0	"	38	0	15	0	"	22	6	7	6	"	14	0
1870	35	6	"	43	0	18	0	"	28	0	10	0	"	17	0
1871	36	6	"	49	0	22	0	"	33	6	14	0	"	20	0
1872	45	0	"	56	0	32	0	"	42	0	16	0	"	22	0
1873	42	0	"	51	0	25	0	"	42	0	15	6	"	22	0
1874	33	6	"	44	6	21	0	"	36	0	12	0	"	17	0
1875	33	0	"	48	6	21	0	"	34	0	13	6	"	23	6
1876	40	0	"	52	6	23	9	"	30	0	13	6	"	25	0
1877	41	0	"	51	0	25	0	"	37	0	15	0	"	24	0
1878	35	6	"	48	0	23	6	"	35	0	14	0	"	22	0
1879	34	0	"	44	0	21	0	"	34	0	14	0	"	20	0
1880	30	0	"	43	6	20	0	"	30	0	12	6	"	20	0
1881	32	0	"	45	6	29	0	"	34	0	14	0	"	20	0
1882	40	0	"	51	0	30	0	"	40	0	14	0	"	20	6
1883	44	0	"	55	6	34	6	"	46	6	15	6	"	23	0
1884	36	0	"	47	6	29	6	"	41	6	12	6	"	20	0

TABLE NO. 1.—CHEVIOT SHEEP—Continued.

Year	Wethers				Ewes				Lambs						
	s	d	s.	d	s	d	s	d	s	d	s	d			
1885	80	0	to	88	0	24	0	to	81	0	12	0	to	18	0
1886	82	0	"	40	0	21	0	"	39	0	12	6	"	19	0
1887	29	0	"	38	0	18	0	"	26	0	11	0	"	16	6
1888	30	0	"	38	0	19	0	"	27	0	12	0	"	17	6
1889	86	0	"	44	0	24	0	"	32	0	14	0	"	22	0
1890	81	0	"	40	0	22	0	"	30	0	12	6	"	20	0
1891	27	0	"	38	0	16	0	"	25	0	9	0	"	16	0
1892	22	0	"	30	6	18	0	"	22	0	5	0	"	11	0
1893	26	0	"	36	6	18	0	"	28	6	8	6	"	15	0
1894	26	0	"	37	0	20	0	"	81	0	10	6	"	18	6
1895	28	0	"	39	0	22	0	"	34	0	11	6	"	19	6
1896	24	6	"	34	0	19	0	"	80	6	9	0	"	16	6
1897	27	0	"	36	0	21	0	"	81	6	11	0	"	17	6
1898	27	0	"	37	0	22	0	"	32	6	12	0	"	18	6
1899	24	0	"	33	0	20	0	"	30	6	10	6	"	16	0
1900	26	0	"	36	0	22	0	"	32	6	12	0	"	17	0

TABLE NO. 2.—BLACKFACED SHEEP.

Year	Wethers				Ewes				Lambs						
	s	d	s	d	s	d	s	d	s	d	s	d			
1810	22	0	to	24	0	12	0	to	15	0	8	0	to	9	0
1820	20	0	"	23	3	15	6	"	17	0	7	0	"	8	6
1821	18	0	"	20	0	12	0	"	13	0	6	0	"	7	0
1822	11	6	"	13	6	5	6	"	6	0	4	6	"	0	0
1823	12	0	"	16	0	5	0	"	6	6	4	0	"	5	3
1824	9	6	"	13	6	6	0	"	7	0	4	0	"	5	0
1825	22	0	"	26	0	11	0	"	18	6	6	0	"	9	0
1826	15	0	"	17	0	8	0	"	9	0	4	6	"	6	0
1827	14	0	"	18	6	7	0	"	10	0	6	0	"	7	6
1828	15	0	"	20	0	8	0	"	11	0	7	0	"	7	6
1829	14	0	"	18	0	9	0	"	10	0	6	0	"	7	0
1830	9	6	"	13	0	4	0	"	6	0	4	6	"	6	0
1831	13	0	"	17	0	5	0	"	7	6	5	0	"	6	6
1832	14	0	"	18	0	7	0	"	11	6	6	0	"	7	8
1833	16	0	"	24	0	7	6	"	12	0	6	6	"	9	0
1834	16	0	"	23	0	10	0	"	13	0	6	0	"	8	6
1835	15	0	"	18	9	10	0	"	13	0	7	0	"	8	0
1836	15	0	"	21	0	9	0	"	12	0	8	6	"	11	0
1837	13	0	"	16	0	8	0	"	12	0	8	0	"	9	6
1838	15	0	"	20	6	10	0	"	13	0	not quoted				
1839	15	0	"	22	0	10	0	"	12	0	7	0	to	8	3
1840	15	0	"	22	6	11	0	"	12	0	7	0	"	9	3
1841	16	0	"	20	0	9	0	"	11	0	6	0	"	8	0
1842	14	0	"	19	0	7	6	"	8	0	5	6	"	7	0
1843	not quoted				4	9	"	6	6	not quoted					
1844	15	0	to	21	0	6	6	"	10	0	5	0	to	8	0
1845	14	0	"	23	0	8	0	"	12	0	6	0	"	8	0
1846	13	0	"	24	0	10	0	"	13	0	8	0	"	9	0
1847	20	6	"	25	0	10	0	"	14	0	8	6	"	9	6
1848	20	0	"	24	0	11	3	"	12	0	9	6	"	10	0
1849	not quoted.				not quoted				not quoted						
1850									7				0	"	0
1851	17	6	to	23	0	9	0	to	12	0	6	6	"	8	0
1852	18	6	"	22	0	9	6	"	12	0	4	6	"	7	9
1853	23	0	"	27	0	14	6	"	16	6	8	0	"	11	6
1854	20	0	"	26	0	11	0	"	16	6	8	0	"	10	6
1855	23	6	"	26	6	14	0	"	16	0	10	0	"	11	0
1856	17	0	"	24	0	10	0	"	20	0	7	6	"	10	0
1857	20	0	"	29	0	10	6	"	15	0	9	3	"	11	0
1858	20	0	"	27	6	9	9	"	18	9	8	3	"	10	6
1859	20	0	"	25	0	10	0	"	14	0	8	9	"	11	0
1860	21	0	"	27	3	11	0	"	16	0	10	0	"	13	6

TABLE No 2 —BLACKFACED SHEEP—*Continued*

Year	Wethers				Ewes				Lambs						
	s	d		s	d	s	d		s	d		s	d		
1861	21	0	to	29	0	12	0	to	22	0	6	3	to	14	0
1862	16	9	"	27	0	12	0	"	18	5	6	0	"	12	0
1863	20	0	"	30	6	13	0	"	16	0	8	0	"	11	6
1864	25	0	"	30	0	15	0	"	19	0	10	0	"	13	6
1865	15	6	"	32	6	15	0	"	25	0	10	0	"	17	0
1866	31	6	"	40	0	20	0	"	36	0	13	6	"	22	6
1867	20	0	"	30	6	14	0	"	22	0	7	6	"	13	6
1868	20	0	"	26	0	10	6	"	13	6	7	0	"	18	0
1869	22	0	"	28	0	11	0	"	14	0	6	9	"	9	0
1870	27	0	"	32	6	18	0	"	22	0	8	0	"	14	6
1871	23	0	"	27	0	13	0	"	23	0	11	0	"	16	3
1872	31	6	"	45	0	18	0	"	32	0	12	6	"	18	0
1873	28	0	"	29	0	16	6	"	27	0	7	0	"	16	0
1874	25	0	"	35	0	18	0	"	20	0	7	0	"	14	0
1875	26	6	"	37	6	15	0	"	21	3	9	6	"	17	6
1876	30	0	"	40	0	19	0	"	24	0	13	0	"	20	6
1877	35	0	"	38	9	19	0	"	25	0	13	6	"	23	0
1878	30	0	"	36	0	17	0	"	23	0	12	0	"	22	0
1879	25	0	"	35	9	16	0	"	24	0	10	6	"	20	0
1880	25	0	"	38	0	16	6	"	22	6	10	0	"	17	0
1881	30	0	"	39	0	15	0	"	23	0	10	0	"	15	0
1882	33	0	"	40	0	20	0	"	28	0	12	6	"	18	6
1883	36	0	"	50	6	24	6	"	33	0	14	0	"	21	6
1884	29	0	"	43	6	19	6	"	28	0	12	0	"	19	6
1885	24	0	"	34	0	13	0	"	22	6	10	0	"	15	0
1886	25	0	"	34	0	12	0	"	22	0	10	6	"	16	0
1887	22	0	"	30	0	11	0	"	19	0	8	0	"	13	0
1888	22	0	"	32	0	13	0	"	24	0	10	0	"	15	0
1889	26	0	"	40	0	18	0	"	29	0	13	0	"	22	0
1890	24	0	"	37	0	14	0	"	27	0	10	6	"	19	0
1891	21	0	"	37	0	10	0	"	24	0	7	6	"	15	0
1892	16	0	"	28	6	6	0	"	17	0	3	0	"	10	0
1893	21	0	"	37	0	12	0	"	24	0	7	0	"	14	6
1894	20	0	"	37	6	14	6	"	26	6	8	6	"	16	0
1895	23	0	"	41	0	16	0	"	28	6	9	0	"	17	0
1896	19	0	"	35	4	13	0	"	24	0	6	0	"	13	6
1897	21	0	"	36	6	15	0	"	25	6	7	0	"	14	6
1898	22	0	"	37	0	16	0	"	26	6	8	0	"	15	0
1899	20	0	"	33	6	13	0	"	24	0	5	6	"	13	0
1900	23	0	"	36	0	16	0	"	26	6	8	0	"	15	6

TABLE No 3 —PRICE OF WOOL, PER STONE OF 24 LB, SINCE 1818

Year	Laid Cheviot				White Cheviot				Laid Highland				White Highland			
	s	d		s	d	s	d	s	d	s	d	s	d	s	d	
1818	40	0	to	42	2			20	0	to	22	6				
1819	21	0	"	22	0			10	0	"	10	3				
1820	20	0	"	22	0			9	0	"	10	0				
1821	18	0	"	20	0			9	0	"	10	0				
1822	12	6	"	14	6			5	0	"	6	6				
1823	9	0	"	10	6			5	0	"	5	9				
1824	13	6	"	15	0			6	0	"	6	3				
1825	10	6	"	22	0			10	0	"	10	6				
1826	11	0	"	14	0			3	0	"	5	6				
1827	11	0	"	14	0			5	6	"	6	9				
1828	8	0	"	11	0			5	6	"	6	0				
1829	8	6	"	11	0			4	3	"	0	0				
1830	9	6	"	11	0			4	6	"	5	0				
1831	17	0	"	20	0			7	6	"	8	6				
1832	14	0	"	16	0			7	0	"	7	6				
1833	18	0	"	20	7			10	0	"	11	0				
1834	21	0	"	24	6			5	6	"	7	0				
1835	19	0	"	20	6			9	6	"	10	8				

TABLE No. 3.—PRICE OF WOOL—Continued.

Year.	Laid Cheviot.		White Cheviot.		Laid Highland.		White Highland.	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1886	21 0	to 25 0	..	..	10 0	to 14 0	..	..
1887	12 0	" 14 0	..	..	7 0	" 7 8	..	..
1888	19 0	" 22 6	..	..	6 0	" 10 0	..	..
1889	18 0	" 20 0	..	..	8 0	" 12 0	..	..
1890	15 0	" 0 0	..	..	7 0	" 0 0	..	..
1891	15 0	" 16 9	..	..	6 0	" 7 5	..	..
1892	12 6	" 14 0	..	..	not quoted.		..	..
1893	9 0	" 11 6	..	..	5 0	to 6 0	..	..
1894	15 0	" 18 0	..	..	not quoted.		..	..
1895	14 6	" 17 6	..	..	7 6	to 8 6	..	..
1896	12 0	" 14 6	..	..	8 0	" 8 6	..	..
1897	12 6	" 14 0	..	..	not quoted.		..	..
1898	9 6	" 11 0	..	..	4 9	to 0 0	..	..
1899	12 0	" 16 6	..	..	6 0	" 6 8	..	..
1890	15 0	" 17 6	..	..	8 0	" 8 6	..	..
1891	12 0	" 16 0	..	..	8 0	" 9 8	..	..
1892	18 0	" 16 0	..	..	8 0	" 9 0	..	..
1893	19 0	" 22 0	..	..	11 0	" 12 6	..	..
1894	12 0	" 15 0	..	..	7 6	" 8 6	..	..
1895	14 6	" 19 0	..	..	8 6	" 9 0	..	..
1896	19 0	" 21 6	..	..	11 0	" 0 0	..	..
1897	19 0	" 24 0	..	..	18 0	" 14 8	..	..
1898	15 0	" 17 0	..	..	8 9	" 10 0	..	..
1899	18 6	" 24 0	..	..	10 9	" 11 6	..	..
1890	22 0	" 32 0	37 0	to 38 0	10 0	" 11 8	..	..
1891	19 6	" 27 0	from 30s. upwards		not quoted.		..	..
1892	18 6	" 26 0	30 0	to 37 0	11 6	to 16 0	..	..
1893	25 6	" 31 0	38 0	" 42 0	15 8	" 17 6	..	..
1894	31 0	" 39 0	47 0	" 54 0	17 6	" 20 0	..	..
1895	23 0	" 30 0	44 0	" 45 0	15 0	" 17 0	..	..
1896	24 0	" 30 0	30 0	" 38 0	14 0	" 16 0	..	..
1897	16 0	" 21 6	not quoted.		not quoted.		..	..
1898	19 0	" 26 0	28 0	to 32 0	8 6	to 9 0	..	..
1899	18 0	" 26 6	not quoted.		8 6	" 10 0	..	..
1890	15 0	" 23 6	25 0	to 26 0	9 6	" 0 0	..	..
1891	20 0	" 26 6	30 0	" 34 6	12 0	" 15 0	..	..
1892	26 0	" 37 6	40 0	" 48 0	18 0	" 21 0	..	..
1893	17 0	" 18 0	34 0	" 40 0	9 0	" 12 0	..	..
1894	18 6	" 26 6	30 0	" 34 0	9 6	" 13 0	..	..
1895	25 0	" 32 0	34 6	" 36 0	12 6	" 16 0	..	..
1896	20 0	" 24 0	30 0	" 34 6	9 6	" 12 0	..	..
1897	20 9	" 26 0	28 0	" 30 0	10 0	" 12 0	..	..
1898	18 9	" 25 0	27 0	" 32 0	8 6	" 11 6	..	..
1899	15 0	" 17 0	prices very low.		7 0	" 0 0	..	..
1890	20 0	" 24 0	30 0	to 32 0	10 6	" 11 6	14 0	to 15 0
1891	17 0	" 21 0	27 0	" 30 0	5 0	" 9 6	12 0	" 13 0
1892	14 0	" 18 0	27 6	" 28 0	7 6	" 9 0	13 0	" 14 0
1893	13 0	" 18 0	26 0	" 28 0	6 6	" 8 6	11 6	" 12 6
1894	13 0	" 18 0	26 0	" 28 0	6 6	" 8 6	11 6	" 12 6
1895	12 0	" 17 0	22 6	" 26 0	6 0	" 8 0	11 6	" 12 0
1896	13 0	" 18 0	23 0	" 27 6	6 6	" 8 6	11 6	" 12 0
1897	14 0	" 22 0	23 0	" 28 0	7 0	" 9 0	11 6	" 13 0
1898	13 0	" 20 0	23 0	" 28 0	7 0	" 9 0	11 0	" 12 6
1899	13 0	" 18 0	24 0	" 28 0	7 0	" 9 0	11 0	" 12 6
1890	13 0	" 18 0	24 0	" 28 0	7 0	" 9 0	11 0	" 12 6
1891	12 6	" 18 0	22 0	" 28 0	7 0	" 9 0	11 0	" 12 6
1892	12 0	" 18 0	20 0	" 28 0	7 0	" 8 6	10 6	" 12 0
1893	12 0	" 17 0	20 0	" 27 0	7 0	" 8 0	10 0	" 12 0
1894	12 0	" 16 0	20 0	" 26 0	7 0	" 8 0	10 0	" 12 0
1895	12 0	" 16 0	20 0	" 25 0	7 0	" 8 0	10 0	" 11 6
1896	11 0	" 16 0	19 0	" 24 0	7 0	" 8 0	10 0	" 11 6
1897	11 0	" 14 0	18 0	" 23 0	7 0	" 8 0	10 6	" 12 0
1898	10 0	" 13 0	16 0	" 20 0	7 0	" 8 0	10 0	" 11 6
1899	10 0	" 13 0	13 0	" 18 6	7 0	" 8 0	8 6	" 9 6
1900	9 9	" 12 6	13 0	" 18 6	6 9	" 7 9	8 0	" 9 6



Fig. 89.—SHORTHORN BULL, "ROYAL DUKE" 75,509.

Winner of President's Medal for best Shorthorn, Stirling Show, 1900. Bred by and the property of her Majesty Queen Victoria. Age two years and four months.



Fig. 90.—ABERDEEN-ANGUS BULL, "DIAZ" 14,272.

Winner of President's Medal for best animal of the breed, Stirling Show, 1900. The property of Mr W Shaw Adamson, Careston Castle, Brechin, and bred by Mr P Chalmers, Aldbar Castle, Brechin. Age three years and six months.

GENERAL SHOW AT STIRLING, 1900.

THE Seventy-third Show of the Society—the last of the nineteenth century—took place at Stirling on Tuesday, 17th July, and three following days of 1900. On five former occasions the Highland Show was held at Stirling—in 1833, 1864, 1873, 1881, and 1891. An excellent and exceptionally convenient site was found in the King's Park. A compact enclosure of less than 30 acres was somewhat small for the extensive display of live stock and implements.

In a season of unsteady and inclement weather the Society was in great good fortune on the days of the Show. Between the morning of the first and the evening of the last day only a few showers of rain fell, and bright strong sunshine was nicely tempered by a cooling breeze. Under these favourable weather conditions the proceedings of the Show moved on smoothly and agreeably for all concerned. The attendance of the public was larger than expected, and the drawings at the gates and stands considerably exceeded those of any former Stirling Show. The Statement of Accounts, which will be found on another page, indicates a highly satisfactory financial result—a profit of over £1000, as compared with a loss of £565 in 1891, and of £972 in 1881.

The Society received hearty local support in promoting the success of the Show. The town of Stirling gave a liberal subscription in addition to a free supply of water, while the counties of Stirling, Dumbarton, and Clackmannan, and the western division of Perthshire, contributed handsomely to the local fund.

The list of premiums for the Show was very liberal. The value of the prizes offered by the Society itself amounted to £2475, and by private donors to about £440, making a total of £2915, or about £800 more than for the Stirling Show of 1891.

In the display of live stock the high standard of recent years was well maintained. The entries of most breeds were numerous, and the general character of the stock highly creditable. In the implement section there was an exceptionally large collection of the most improved farm machines and implements. Business in this department was active, and encouraging to exhibitors.

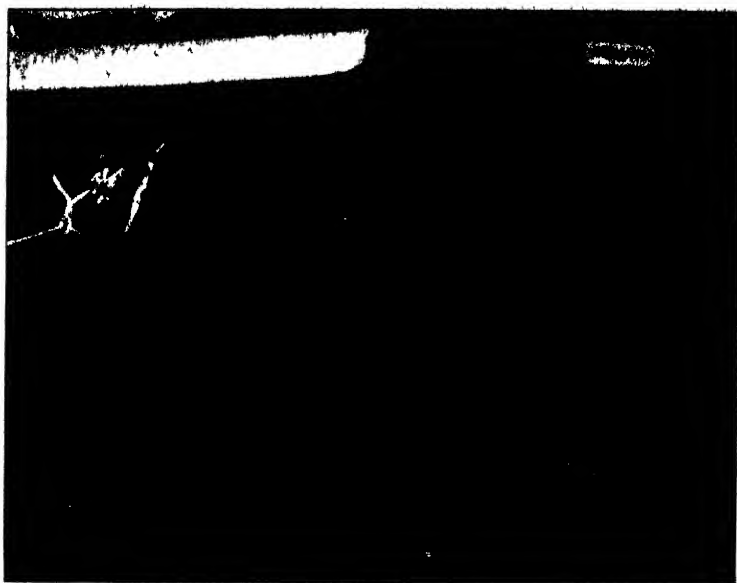


Fig 91.—GALLOWAY COW, "NANCY LEE 3RD OF CASTLEMIK" 15,019

Winner of President's Medal for best animal of the breed Stirling Show, 1900 Bred by and the property of Sir Robert Jardine of Castlemilk, Bart Age three years and five months



Fig 92.—HIGHLAND BULL, "CALUM BUIDHE OF ATHOLL."

Winner of President's Medal for best animal of the breed, Stirling Show, 1900, Bred by and the property of the Duke of Atholl, K.T., Blair Castle Age two years and five months

Statistics.

The following tables give the number of entries in the various sections :—

1. CATTLE.

Class.	SHORTHORN.	No of Entries.
1. Aged bulls . . .		7
2. Two-year-old bulls . . .		9
3. One-year-old bulls . . .		22
4. Cows of any age . . .		6
5. Two-year-old heifers . . .		11
6. One-year-old heifers . . .		17
		— 72
	ABERDEEN ANGUS.	
7. Aged bulls . . .		11
8. Two-year-old bulls . . .		6
9. One-year-old bulls . . .		10
10. Cows of any age . . .		12
11. Two-year-old heifers . . .		6
12. One-year-old heifers . . .		20
		— 65
	GALLOWAY	
13. Aged bulls . . .		9
14. Two-year-old bulls . . .		4
15. One-year-old bulls . . .		6
16. Cows of any age . . .		6
17. Two-year-old heifers . . .		9
18. One-year-old heifers . . .		12
		— 46
	HIGHLAND.	
19. Aged bulls . . .		5
20. Two-year-old bulls . . .		9
21. One-year-old bulls . . .		15
22. Cows of any age . . .		12
23. Three-year-old heifers . . .		6
24. Two-year-old heifers . . .		9
25. Bullocks . . .		17
		— 73
	AYRSHIRE.	
26. Aged bulls . . .		
27. Two-year-old bulls . . .		
28. One-year-old bulls . . .		
29. Cows in milk, calved before 1897 . . .		4
30. Cows in milk, calved in 1897 . . .		10
31. Cows of any age, in calf, or heifers in calf, calved in 1897 . . .		6
32. Two-year-old heifers . . .		4
33. One-year-old heifers . . .		4
		— 43
	JERSEY.	
34. Bulls, any age . . .		4
35. Cows in milk, calved before 1898 . . .		8
36. Cows in milk, or heifers in calf, calved in 1898 . . .		2
37. One-year-old heifers . . .		4
		— 18
Extra cattle . . .		4
		321

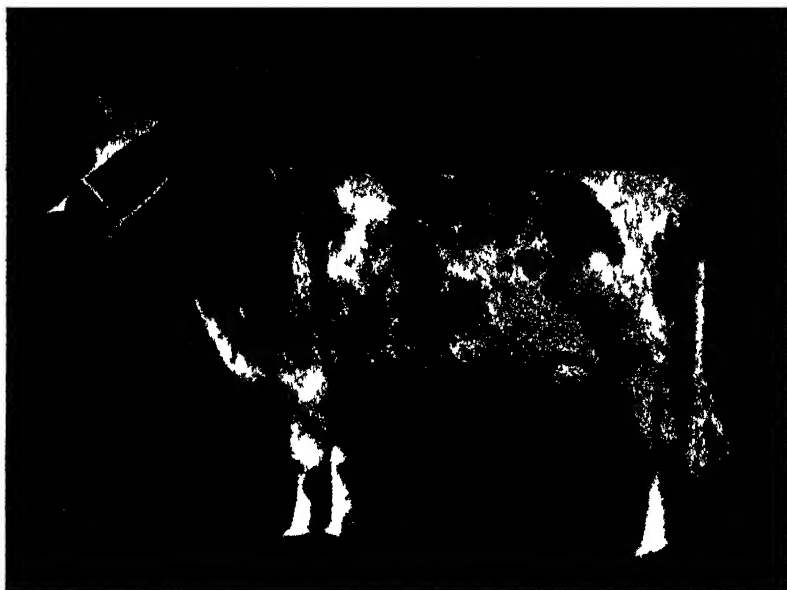


Fig 93 —AIRSHIRE COW, ' WHITE ROSE 2ND 12,052

Winner of President's Medal for best animal of the breed, Stirling Show 1900. Bred by and the property of Mr W H. Mac Burnhouses, Galston. Age four years.

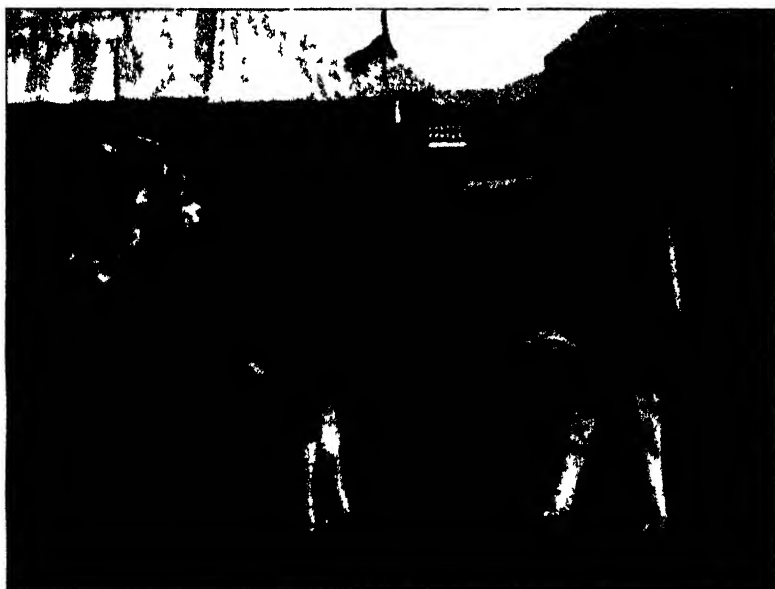


Fig 94 —JERSEY COW, "DAISY "

Winner of President's Medal for best animal of the breed, Stirling Show 1900. The property of Mr T R B Elliot, yr of Clifton Park, Kelso, and bred by Lord Rothschild, Fring Park, Herts. Age three years and seven months.

2. HORSES.

DRAUGHT STALLIONS.

38. Aged stallions	.	.	.	.	.	.	14
39. Three-year-old entire colts	.	.	.	.	.	.	11
40. Two-year-old entire colts	.	.	.	.	.	.	18
41. One-year-old entire colts	.	.	.	.	.	.	16
							— 59

DRAUGHT GELDINGS

42. Aged geldings	.	.	.	.	.	.	10
43. Three-year-old geldings	.	.	.	.	.	.	7
44. Two-year-old geldings	.	.	.	.	.	.	3
							— 20

DRAUGHT MARES AND FILLIES.

45. Mares with foal at foot	.	.	.	.	.	.	12
Extra stock	.	.	.	.	.	.	2
46. Yeld mares, foaled before 1897	.	.	.	.	.	.	12
47. Three-year-old yeld mares, or fillies	.	.	.	.	.	.	12
48. Two-year-old fillies	.	.	.	.	.	.	20
49. One-year-old fillies	.	.	.	.	.	.	15
							— 73

HUNTERS.

50. Colt, gelding or filly, foaled in 1899, the produce of thoroughbred stallions	.	.	.	.	.	.	8
51. Filly, mare, or gelding for field, foaled in 1898	.	.	.	.	.	.	4
52. Yeld mare, filly, or gelding for field, foaled in 1897	.	.	.	.	.	.	8
53. Mare or gelding, foaled before 1st January 1897, able to carry over 13 stone 7 lb.	.	.	.	.	.	.	4
54. Mare or gelding, foaled before 1st January 1897, able to carry any weight up to 13 stone 7 lb.	.	.	.	.	.	.	2
55. Hunter, brood mare, with foal at foot, or to foal this season	.	.	.	.	.	.	4
							— 30

HACKNEYS.

56. Brood mares, 15 hands and upwards, with foal at foot, or to foal this season to a registered sire	.	.	.	.	.	.	3
57. Brood mares, under 15 hands, with foal at foot, or to foal this season to a registered sire	.	.	.	.	.	.	6
58. Yeld mares or fillies, three years old	.	.	.	.	.	.	5
Extra stock	.	.	.	.	.	.	1
59. Fillies, two years old	.	.	.	.	.	.	3
60. Fillies, one year old	.	.	.	.	.	.	6
61. Stallion, foaled in or before 1897, over 15 hands	.	.	.	.	.	.	1
62. Stallions, foaled in or before 1897, over 14 and not over 15 hands	.	.	.	.	.	.	2
63. Entire colts, two years old	.	.	.	.	.	.	3
64. Entire colts, one year old	.	.	.	.	.	.	3
							— 33

PONIES.

65. Stallions, 3 years old and upwards, over 12 and not exceeding 14 hands	.	.	.	.	.	.	3
66. Yeld mares, fillies, or geldings, 3 years old and upwards, over 13 and not over 14½ hands	.	.	.	.	.	.	6
67. Yeld mares, fillies, or geldings, 3 years old and upwards, over 12 and not over 13 hands	.	.	.	.	.	.	3
68. Stallion, 3 years old and upwards, 12 hands and under. (No Entry.)	.	.	.	.	.	.
69. Yeld mares, fillies, or geldings, 3 years old and upwards, 12 hands and under	.	.	.	.	.	.	3
70. Shetland stallions, not exceeding 10½ hands, foaled before 1898	.	.	.	.	.	.	11
71. Shetland mares, not exceeding 10½ hands, with foal at foot	.	.	.	.	.	.	7
72. Shetland yeld mares, fillies, or geldings, not exceeding 10½ hands, foaled before 1898	.	.	.	.	.	.	16
73. Shetland colts, geldings, mares, or fillies, foaled in 1898 or 1899, not exceeding 10½ hands	.	.	.	.	.	.	4
							— 53



Fig 95 —CLYDESDALE STALLION, "PRINCE THOMAS" 10,262

Winner of President's Medal for best Clydesdale Stallion or Colt, Stirling Show 1900. The property of Messrs A. & W. Montgomery, Netherhill and Banks, Kirkcubright and bred by the Marquis of Londonderry, Seaham Harbour. Age five years and two months.

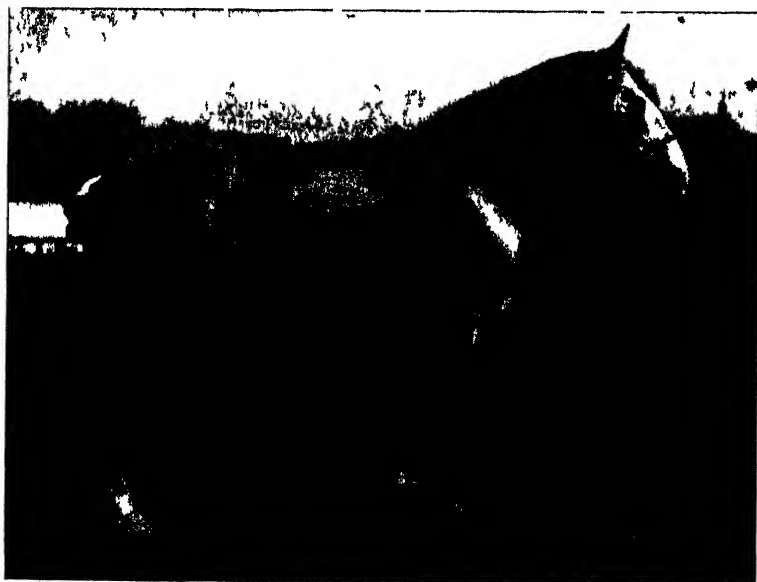


Fig 96 —DRAUGHT GELDING, "PERFECTION"

Winner of President's Medal for best Draught Gelding, Stirling Show 1900. The property of Mr W. Clark, Netherlea, Cathcart and bred by Mr Edwin Bolton, West Plein, Bannockburn. Age three years.

DRIVING COMPETITIONS.

74. Yeld mares, fillies, or geldings, in harness, 15 hands and upwards .	11
75. Yeld mares, fillies, or geldings, in harness, under 15 hands (15) .	9
	— 20
	<hr/> 288

JUMPING.

1. Horses—open	12
2. Ponies, 14.3 hands and under	7
3. Horses—open handicap	11
4. Ponies, 14.3 hands or under—handicap	6
5. Horses—open handicap	6
6. Ponies, 14.3 hands or under—handicap	5
	— 47

3. SHEEP.

BLACKFACED.

76. Tups above one shear	21
77. Shearling tups	34
78. Ewes above one shear, with lambs	9
79. Shearling ewes or gimmers	19
	— 83

CHEVIOT.

80. Tups above one shear	18
81. Shearling tups	20
82. Ewes above one shear, with lambs	13
83. Shearling ewes or gimmers	22
	— 73

BORDER LEICESTER

84. Tups above one shear	16
85. Shearling tups	42
86. Ewes above one shear	12
87. Shearling ewes or gimmers	35
	— 105

HALF BRD.

88. Tups above one shear	5
89. Shearling tups	12
90. Ewes above one shear	8
91. Shearling ewes or gimmers	11
	— 36

SHROPSHIRE.

92. Tups above one shear	4
93. Shearling tups	11
94. Ewes above one shear	4
95. Shearling ewes or gimmers	7
	— 26

OXFORD DOWNS.

96. Shearling tups	8
Extra stock	1
97. Shearling ewes or gimmers	4
	— 13

SUFFOLK.

98. Shearling tups	3
99. Shearling ewes or gimmers	4
100. Three ewe lambs	2

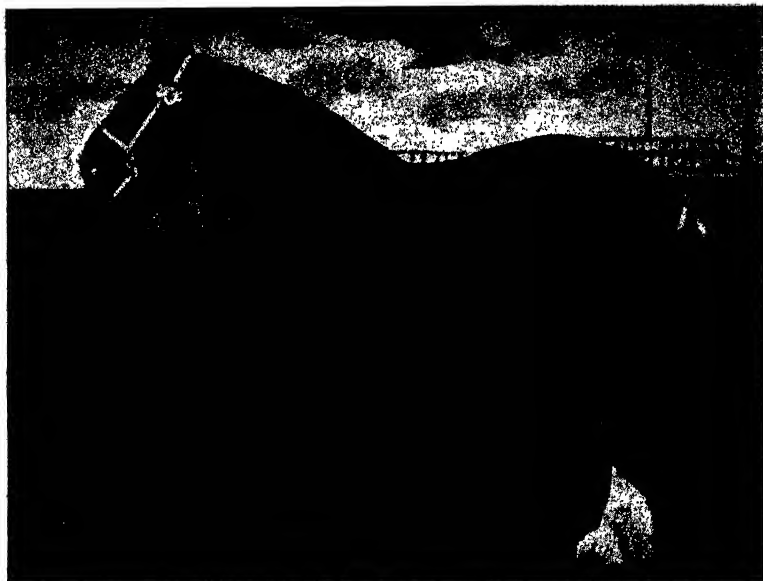


Fig. 97.—CLYDESDALE MARE, "LADY LOTHIAN" 13,319.

Winner of President's Medal for best Clydesdale Mare or Filly, Stirling Show, 1900. The property of Mr Herbert Webster, Morton House, Fence Houses, and bred by Mr Richard Little, Wormanby, Carlisle. Age seven years.



Fig. 98.—HUNTER MARE, "COUNTESS" 2246.

Winner of President's Medal for best Hunter, Stirling Show, 1900. The property of Mr Edward Hoyle, Moorlands, Bacup, and bred by Mr F. Costes, Newsham, Malton. Age six years.

EXTRA SECTIONS.

101. Three blackfaced wethers, one shear	4
102. Three Cheviot wethers, one shear	2
103. Three shearing wethers, any cross out of blackfaced ewe	6
104. Fat lambs, any breed or cross	11
Extra stock	1
	<hr/> 24

4. WOOL.

105. Blackface wether wool	5
106. Blackface ewe wool	9
107. Blackface ewe or wether hogg wool	10
	<hr/> 24

5. SWINE.

108. Boars, large white breed	3
109. Sows, large white breed	2
110. Pigs not above 8 months old, large white breed	6
111. Boars, white breed other than large	3
112. Sow, white breed other than large	3
113. Pigs not above 8 months old, white breed other than large	3
114. Boars, Berkshire breed	2
115. Sows, Berkshire breed	4
116. Pigs not above 8 months old, Berkshire breed	2
	<hr/> 28

6. POULTRY.

1 80 Poultry	457
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7. DAIRY PRODUCE.

1. Cured butter, not less than 7 lb.	15
2. Powdered butter, not less than 7 lb.	17
3. Fresh butter, 3 lb. rolls	21
4. Cheddar Cheese, 56 lb. and upwards	8
5. Cheddar Cheese, 14 lb. and under	5
	<hr/> 66

ABSTRACT.

	No. of Entries.
1. Cattle	321
2. Horses	288
3. Sheep	369
4. Wool	24
5. Swine	28
6. Poultry	457
7. Dairy produce	66

The following table gives a comparative view of the display of cattle, horses, sheep, swine, poultry, dairy produce, and implements, of the value of the premiums offered, and of the



Fig 99 —HACKNEY COLT, ' ARBARA ' 6964

Winner of President's Medal for best Hackney Stirling Show 1900. Breeding and the property of Mr Charles E. Galbraith Terregles Dumfries Age two years



Fig 100 —PONY MARE "TWINKIE

Winner of President's Medal for best Pony Stirling Show 1900. The property of Mr Andrew Wilson North Mains Stepps near Glasgow Age six years

receipts at the entrance-gates, grand stands, and for catalogues at the Shows which have been held at Stirling —

Year.	Cattle.	Horses.	Sheep.	Wool.	Swine.	Poultry.	Dairy Produce.	Butter-making.	Implements.	Premiums.	Receipts.
1838	288	68	60		40				22	£558	£211
1864	397	181	262		50	84			978	1350	1729
1878	406	297	278		62	387			1400	1860	3140
1881	336	215	211		29	294			2001	2340	2577
1891	318	252	210		41	317	65		1563	2114	2930
1900	321	288	369	24	28	457	66		2095	2915	4305

A Comparison

The following figures, relating to some of the most successful Shows the Society has held, will be perused with interest —

	Cattle	Horses	Sheep	Swine	Poultry	Total Live Stock	Implements	Premiums	Drawings at Show	Profit
Edinburgh 1869	310	212	340	22	239	1123	1900	£1600	£4 078	£2067
Glasgow 1875	411	405	296	48	479	1639	2220	2665	6 231	3316
Edinburgh, 1877	339	342	305	30	234	1250	2292	2711	6 734	3710
Edinburgh, 1884	560	453	493	35	253	1814	2282	4813	6,548	1855
Edinburgh, 1893	380	349	294	31	360	1414	2268	2600	4,918	2323
Aberdeen 1894	314	324	184	34	365	1221	2532	2440	5,121	1678
Perth, 1896	292	258	204	20	374	1148	1945	2205	4,788	2511
Glasgow, 1897	317	350	245	30	275	1217	2227	2897	4 392	2021
Edinburgh 1899	386	518	477	46	551	1978	2585	3844	10,285	3911
Stirling, 1900	321	288	369	28	457	1463	2095	2915	4,305	1078

Cattle.

The breeds of cattle were all well represented both as regards numbers and quality. A noteworthy feature, which gave universal gratification, was the great success of cattle exhibited from the Royal herds at Windsor and Balmoral. Destined as it was to be the last occasion on which our late gracious and beloved Sovereign Queen Victoria was to appear as an exhibitor in the Highland Show, it was not unfitting that the fates should smile upon her Majesty. With three shorthorns from Windsor and three Aberdeen-Angus cattle from Balmoral, her Majesty won no fewer than eleven honours, including four first and five special prizes—a record this of which any breeder might well be proud. It was a happy inspiration which led the Chairman of the Board of Directors, Mr Alexander M Gordon of Newton,



Fig 101 — SHETLAND PONY MARI, 'EMFRAID' 1275

Winner of President's Medal for best Shetland Pony, Stirling Show 1900. The property of Mrs Wentworth Hope Johnstone Skevnes, Edenbridge Kent, and bred by the Marquis of Londonderry. Age seven years



Fig 102 — HACKNEY MARE

Winner of President's Medal for best animal in the Harness classes, Stirling Show, 1900. The property of Mr Alexander Gemmell, Chelston, Ayr. Age five years

to suggest that, as a simple memento of the signal success thus attained by the Royal exhibits, a specially bound copy of the Show Catalogue and Official List of Awards should be offered to her Majesty. The gift was graciously accepted by the Queen, and was acknowledged by her Majesty's Commissioner, Mr James Forbes, in a letter which concludes as follows: "The Catalogue is interesting to the Queen not only in view of the great success of the Show, of which her Majesty was glad to learn, but also of the success of her own exhibits, and I am commanded to convey to yourself and your co-Directors and the Society her Majesty's thanks for it."

Shorthorn cattle made a strong display. The entries were numerous, and there was no lack of merit. The President's Champion Medal for the best animal of the breed went to her Majesty the Queen for "Royal Duke" 75,509 (fig. 89). This handsome two-year-old roan bull was bred at Windsor, and has won champion honours at several other leading shows, including the Royal Dublin Society's Show at Dublin in April and the Royal English Show at York in June 1900. His sire was "Prince Victor" 73,320, and dam "Rosewater" by "Red Rover" 63,192. Brought out in the very pink of condition, this grand bull showed admirable shapes, great wealth and depth of carcass, and desirable character and quality. It will be seen from the official list of awards that "Royal Duke" obtained no fewer than four honours at Stirling. Aged Shorthorn bulls made up a small but fairly good class. The class of two-year-old bulls was a shade stronger, while yearling Shorthorn bulls was the largest in the cattle section of the Show. There was an abundance of high merit amongst the young bulls. Shorthorn cows have sometimes made a stronger class; two-year-old heifers rarely as strong. In the latter class the first prize went to her Majesty the Queen for "Rose of Sharon," an exceedingly handsome roan bred at Windsor, and got by "Prince Victor" 73,320. The special prize of £10, 10s., given by Mr Gordon of Newton for the best Shorthorn female, was also won by this attractive heifer. A large and excellent class of yearling Shorthorn heifers was again headed by an exhibit from the Royal herd at Windsor, the winner here being "Maritana," a big well-formed white got by "Liberator" 64,260.

Aberdeen-Angus cattle have a high showyard reputation to maintain. They did it no harm on this occasion. The classes were well enough supported with entries, and, as a rule, the standard of merit was high. The class of aged bulls, with its eleven entries, made a capital appearance. Mr W. Shaw Adamson's "Diaz" 14,272 (fig. 90) made a creditable winner, and ultimately became the champion of the breed. He was bred by Mr P. Chalmers, Aldbar Castle, Brechin, got by "Enthusiast of



Fig 103 —BLACKFACED TUP, "A 1"

Winner of President's Medal for best animal of the breed Stirling Show, 1900 Bred by and the property of Mr J Howatson of Glenbuck Age two shear

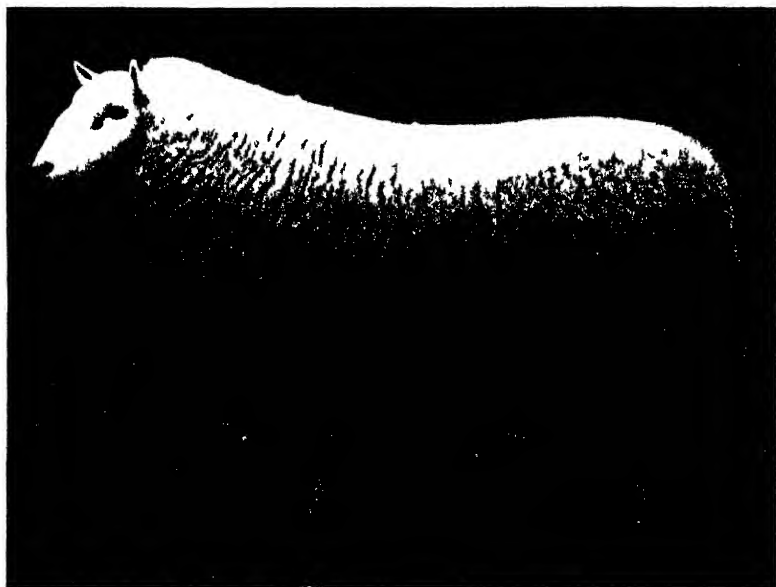


Fig 104 —CHEVIOT TUP

Winner of President's Medal for best animal of the breed Stirling Show, 1900 Bred by and the property of Mr John Elliot, Hindhope, Jedburgh Age one shear

Ballindalloch" 8289, and out of "Pride of Burnshangie" 21,047, by "Pilchard" 7827. He is a well-shaped stylish bull of excellent quality. Two-year-old bulls displayed high average merit, and yearling bulls were good, but have occasionally been better. No fewer than a dozen cows were catalogued, and a capital lot they made. The highest honours here went to her Majesty the Queen for the handsome five-year-old cow "Princess Irene 6th" 22,586, which was closely followed by Mr Thomas Smith's attractive six-year-old cow "Stumpie 29th" 21,065. The Balmoral cow failed to produce a calf, as required by the Society's regulations, and, on this account, the first prize in the cow class became credited to "Stumpie 29th." There was a very good but small class of two-year-old heifers, while the class of yearling Aberdeen-Angus heifers was exceptionally strong both as to numbers and merit.

Galloway cattle have seldom made a better appearance in any showyard. The classes were nearly all most creditably filled. The President's Medal for the best animal of the breed went to Sir Robert Jardine of Castlemilk, Bart., for "Nancy Lee 3rd of Castlemilk" 15,019 (fig. 91), a very well-shaped three-year-old cow of Sir Robert's own breeding, got by "Black Douglas of Castlemilk" 5002, and out of "Nancy Lee of Castlemilk" 11,971, by "Merle of Tarbreoch" 4855. Although the highest honour thus went to the female classes, there was no lack of merit amongst the Galloway bulls, most of them being animals of good shape and true Galloway character. The Galloway heifers made an attractive and meritorious display.

Highland cattle well maintain their claim to a prominent position in the National Showyard. They had the credit on this occasion of making up the highest number of entries amongst the breeds of cattle; and in merit there was no falling off from the high standard of recent years. The President's Champion Medal for the best animal of the breed went to the Duke of Atholl for his grand two-year-old bull "Calum Buidhe of Atholl" (fig. 92), a stylish yellow bull of his Grace's own breeding, got by "Valentine V." 1062, out of "Tè Bhuidhe" 1379, by "Calum Odhar" 79.

The Ayrshire breed of cattle made a fair appearance in regard to number of entries, and was creditably represented in respect of merit. The champion animal here was found in "White Rose 2nd" 12,052 (fig. 93), a well-formed and useful-looking four-year-old cow, bred and owned by Mr William Howie, Burnhouses, Galston. This handsome young cow was got by "Sloth Boy" 3966, and out of "White Rose 1st" 10,405, got by "Bute of Burnhouses" 3388.

The classes for Jersey cattle brought out a small but very good representation of this famous milking breed. Mr T. R. B.

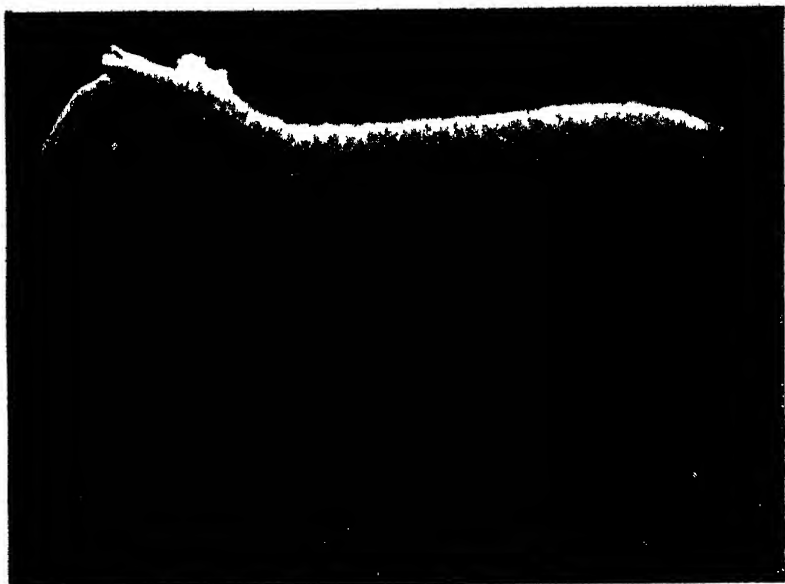


Fig 105 —BORDER LEICESTER EWE

Winner of President's Medal for best animal of the breed, Stirling Show 1900 Bred by and the property of Mr D Hume Barriellwell Brechin Age one shear



Fig 106 —HALF-BRED EWE

Winner of President's Medal for best animal of the breed, Stirling Show 1900 Bred by and the property of Mr I M Crossman, Goswick, Berks Age one shear

Elliot, yr. of Clifton Park, Kelso, won the President's Champion Medal for the best Jersey with his very attractive three-year-old cow "Daisy" (fig. 94), bred by Lord Rothschild, got by "Great Scott" 5574, and out of "Bradford Daisy 2nd," by "Golden Lad" 3324.

Horses.

The classes of Clydesdale horses were unusually well filled. The entries were numerous, and all over the quality was high. Aged stallions made a capital display in the ring. Three-year-old colts were still better, and yet stronger both as to numbers and merit was the class of two-year-old colts. Yearling colts were very good indeed. The President's Champion Medal for the best Clydesdale colt or stallion went to Messrs W. & A. Montgomery for their very useful five-year-old dark-brown horse "Prince Thomas" 10,262 (fig. 95). This handsome horse was bred by the Marquis of Londonderry, got by "Sir Thomas" 9681, and out of "Comely" 10,764, by "Flashwood" 3604.

Draught geldings made a very good appearance, the Champion Medal going to Mr Wm. Clark for his powerfully built grey roan three-year-old gelding "Perfection" (fig. 96), bred by Mr Edwin Bolton, West Plean, Bannockburn, got by "Royal Gartly" 9844, and out of a mare by "Prince Patrick" 9833.

Clydesdale mares and fillies well maintained the good name of the breed. The entries were creditable, and in the average standard of merit there was no falling off from the high level reached in recent years. The Champion Medal for the best Clydesdale mare or filly, as well as the Cawdor Challenge Cup, was secured by Mr Herbert Webster for his grand seven-year-old mare "Lady Lothian" 13,319 (fig. 97), which won the first prize in the mare class at Perth in 1896, and was shown here as "Extra Stock." She was bred by Mr Richard Little, Wormanby, Carlisle, got by "Lord Lothian" 5998, and out of "Nancy of Wormanby," got by "Prince Henry" 1257.

Hunters were few in number, yet the classes contained a few animals of high merit. The Champion Medal was won by Mr Edward Hoyle for his handsome six-year-old bay mare "Countess" 2246 (fig. 98), bred by Mr F. Coates, Newsham, Malton, got by "Spendthrift" 83, and out of a mare by "Conductor" 20.

The classes of Hackneys were small, but the standard of merit was indeed highly creditable. The Champion Medal for best Hackney went to Mr Charles E. Galbraith for his stylish two-year-old chestnut colt "Atbara" 6964 (fig. 99), bred by himself, got by "Garton Duke of Connaught" 3009, and out of "Lola" 4248, by "Cadet" 1251.



Fig 107 —SHROPSHIRE TUP, "ASHLYN'S KNIGHT"

Winner of President's Medal for best animal of the breed, Stirling Show 1900. The property of Mr R. P. Cooper, Ashlyn's Hall, Brighthelmstead, Herts. and bred by Mr Buttar, Corston, County Angus.



Fig 108 —OXFORD DOWN TUP

Winner of President's Medal for best animal of the breed, Stirling Show 1900. Bred by and the property of Messrs J. & S. Treadwell, Winchendon, Aylesbury. Age one shear.

Ponies made a very interesting display. Here the Champion Medal went to Mr Andrew Wilson for his attractive six-year-old chestnut mare "Twinkle" (fig. 100), of unknown breeding. As usual, the show of Shetland ponies excited much interest and admiration. Mrs Wentworth Hope Johnstone secured the Champion Medal with her beautiful little seven-year-old mare "Emerald" 1275 (fig. 101), bred by the Marquis of Londonderry, got by "Odin" 32, and out of "Eppie" 180, by "Jack" 16. This attractive little animal also won Mr Mackenzie's Silver Cup for the best Shetland pony exhibited in saddle or harness.

The display made in the driving classes was very good indeed,

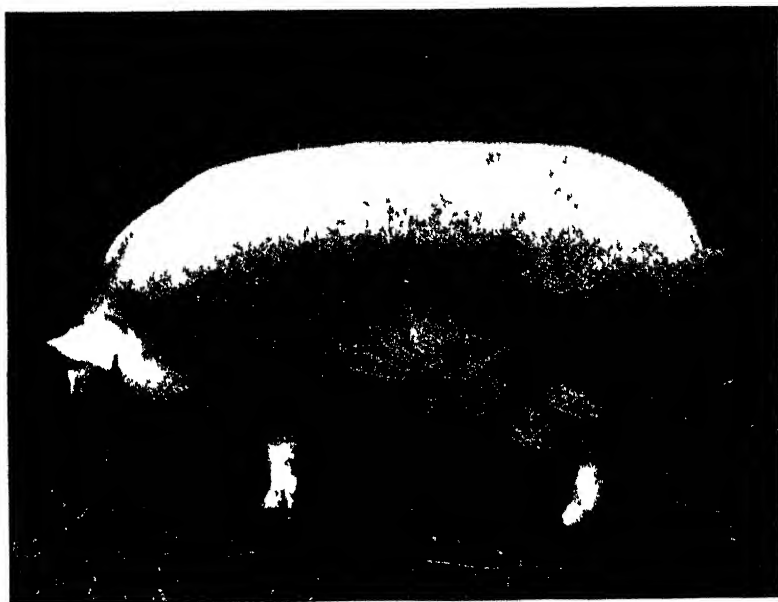


Fig. 109.—WHITE SOW, 9834.

Winner of President's Medal for the best Pig, Stirling Show, 1900. Bred by and the property of Messrs R & W Walker, East Craigs Farm, Corstorphine. Age one year and five months.

while, as usual, the jumping was performed creditably, and excited much interest amongst the visitors.

Sheep, &c.

The classes of sheep were, on the whole, extremely well filled, all the leading breeds being strongly represented alike as to numbers and quality. The figs. 103 to 108 represent winners of Champion Medals. There was a small but good show of swine, and a capital display of poultry.

PREMIUMS AWARDED BY THE SOCIETY IN 1900.

R. & J. GARTON, Newton-le-Willows, Lancashire, in recognition of their work
in raising new varieties of grain and grasses—Large Gold Medal.

STIRLING SHOW

17th, 18th, 19th, and 20th July 1900

ABBREVIATIONS.—V., *Very Highly Commended*. H., *Highly Commended*.
C., *Commended*.

CATTLE

SHORTHORN.

PRESIDENT'S CHAMPION MEDAL for best Shorthorn.

- No. 14. Her Majesty The Queen, The Prince Consort's Shaw Farm, Windsor, Berks,
"Royal Duke" (75,509).

Best Bull in Classes 1, 2, and 3—£20, given by the Shorthorn Society.

- No. 14. Her Majesty The Queen, The Prince Consort's Shaw Farm, Windsor, Berks,
"Royal Duke" (75,509).

Breeder of best Bull of any age in Classes 1, 2, and 3—The Silver Medal.

- No. 14. Her Majesty The Queen, The Prince Consort's Shaw Farm, Windsor, Berks,
"Royal Duke" (75,509).

CLASS 1. BULL, calved before 1898.—Premiums, £15, £10, £5, and £3.

- 1st. No. 2. C. Home Graham-Stirling of Strowan, Crieff, "Sportsman" (75,719).
2nd. No. 7. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Villager."
3rd. No. 3. John Handley, Greenhead, Milnthorpe, Westmorland, "Lord James
Douglas" (70,826).
4th. No. 1. Sir John Gilmour of Lundin and Montrave, Bart., Leven, "Oliver
Cromwell" (69,199).
H. No. 5. George Longmore, Rettie, Banff, "Star of Destiny" (71,682).

CLASS 2. BULL, calved in 1898.—Premiums, £15, £10, £5, and £3.

- 1st. No. 14. Her Majesty The Queen, The Prince Consort's Shaw Farm, Windsor,
Berks, "Royal Duke" (75,509).
2nd. No. 9. C. Home Graham-Stirling of Strowan, Crieff, "Bright Star" (74,116).
3rd. No. 15. George Shepherd, Shethin, Tarves, "Waterloo Ensign."
4th. No. 12. D. MacLennan, 42 Sackville Street, Piccadilly, London, W., "Dorset
Prince" (74,868).
V. No. 10. C. Home Graham-Stirling of Strowan, Crieff, "Strowan Butterfly
VIII." (75,760).
H. No. 16. Robert Taylor, Pitlilie Farm, Carnoustie, "His Grace" (74,705).

CLASS 3. BULL, calved in 1899.—Premiums, £12, £8, £4, and £2.

- 1st. No. 28. D. MacIennan, 42 Sackville Street, Piccadilly, London, W., "Lord Lovat."
 2nd. No. 33. Colonel John Murray, Polmaise Castle, Stirling, "Consul."
 3rd. No. 38. Robert Taylor, Pitlivie Farm, Carnoustie, "Bold Archer."
 4th. No. 18. F. C. Fletcher of Letham Grange, Arbroath, "Mysterious."
 V. No. 36. A. Robertson, Haugh of Ballechin, Ballinluig, "Macbeth."
 H. No. 29. James M'William, Stoneytown, Keith, "Pride of Lancaster."
 C. No. 22. J. Maxtone Graham, Battleby, Redgorton, Perth, N.B., "White Archer."
 C. No. 32. Colonel Charles Munro, Mains of Murthly, Aberfeldy, "Romulus."

Best Female in Classes 4, 5, and 6—£10, 10s., given by
 Mr Alexander M. Gordon of Newton.

- No. 52. Her Majesty The Queen, The Prince Consort's Shaw Farm, Windsor, Berks, "Rose of Sharon."

CLASS 4. COW, of any age.—Premiums, £12, £8, £4, and £2.

- 1st. No. 41. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Dalmeny Nonpareil 3rd."
 2nd. No. 41. David Hume, Barrelwell, Brechin, "Flood."
 3rd. No. 40. C. Home Graham-Stirling of Strowan, Crieff, "Strowan Buttercup XII."
 4th. No. 43. John J. Moubray of Naemoor, Rumbling Bridge, "Dame Honoria Riby."

CLASS 5. HEIFER, calved in 1898.—Premiums, £10, £5, £3, and £2.

- 1st. No. 52. Her Majesty The Queen, The Prince Consort's Shaw Farm, Windsor, Berks, "Rose of Sharon."
 2nd. No. 55. Duncan Stewart of Millhills, Crieff, "Lady 22nd."
 3rd. No. 53. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Countess 3rd."
 4th. No. 45. William Bell, Ratchengh, Alnwick, "Clara."
 V. No. 50. William T. Malcolm, Dunmore Home Farm, by Larbert, "Pavonia."
 H. No. 48. Sir John Gilmour of Lundin and Montrave, Bart., Leven, "Annie Wenlock."

CLASS 6. HEIFER, calved in 1899.—Premiums, £10, £5, £3, and £2.

- 1st. No. 68. Her Majesty The Queen, The Prince Consort's Shaw Farm, Windsor, Berks, "Maritana."
 2nd. No. 64. David Hume, Barrelwell, Brechin, "Floradora."
 3rd. No. 67. James M'William, Stoneytown, Keith, "Hilda."
 4th. No. 69. A. Robertson, Haugh of Ballechin, Ballinluig, "Red Tulip."
 V. No. 58. J. Douglas Fletcher of Rosehaugh, Avoch, N.B., "Lady Dorothea."
 V. No. 70. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Gladys of Dalmeny."
 H. No. 62. J. Maxtone Graham, Battleby, Redgorton, Perth, N.B., "White Fairy Queen."
 C. No. 59. Sir John Gilmour of Lundin and Montrave, Bart., Leven, Fife, "Truthful."
 C. No. 72. Robert Taylor, Pitlivie Farm, Carnoustie, "Princess of Pitlivie 2nd."

ABERDEEN-ANGUS.

PRESIDENT'S CHAMPION MEDAL for best Aberdeen-Angus Animal.

- No. 73. William Shaw Adamson, Careston Castle, Brechin, "Diaz" (14,272).

Best Bull of any age in Classes 7, 8, and 9—Ballindalloch Challenge Cup, value £50, given by Sir George Macpherson Grant, Bart.

- No. 73. William Shaw Adamson, Careston Castle, Brechin, "Diaz" (14,272).

Breeder of best Bull of any age in Classes 7, 8, and 9—The Silver Medal

No 73 Patrick Chalmers, Aldbar Castle, Brechin

Breeder of the Winner of the Ballindalloch Challenge Cup Silver Medal

Patrick Chalmers, Aldbar Castle, Brechin

*Best Breeding Animal of the Breed—Champion Gold Medal,
given by the Polled Cattle Society*

No 73 William Shaw Adamson, Careston Castle, Brechin, "Diaz" (14,272)

CLASS 7 BULL, calved before 1st December 1897 —
Premiums, £15, £10, £5, and £3

1st	No 73	William Shaw Adamson, Careston Castle, Brechin, "Diaz" (14,272)
2nd	No 81	James Whyte, Hayston, Glamis, "Jipsey Baron" (13,532)
3rd	No 74	Thomas F Inkson, Kinermony, Aberlour, Strathspey, "Jim of Morlich" (13,531)
4th	No 82	Archibald Whyte, Inverquhar, Kirriemuir, "Rover of Laughton" (14,942)
V	No 80	Gordon R Shriach, Morriston, Flin, "Elder of Benton" (14,323)
H	No 76	J Ernest Kerr, Harviestoun, Dollar, "Mario of Ballindalloch" (11,896)
C	No 79	Her Majesty The Queen, Abergeldie Mains, Ballater, "Jurymen of Whitelums" (16,732)

CLASS 8 BULL, calved on or after 1st December 1897 —
Premiums, £15, £10, £5, and £3

1st	No 87	C W Dyson Perrins, Ardross Castle, Alness, "Rosador" (15,996)
2nd	No 94	George Bruce, Lochineal Cullen, "Egmont of Pitpointie" (15,369)
3rd	No 85	I C Fletcher of Letham Grange, Arbroath, "Enterprise of Abcoulour" (15,407)
4th	No 89	Hugh Wilson, Milton of Noth, Rhynie, Aberdeenshire, "Hungist of Pitpointie" (15,535)
V	No 88	Andrew F Reid, Auchterarder House, Auchterarder, "Meridian of Glamis" (15,743)

CLASS 9 BULL, calved on or after 1st December 1898 —
Premiums, £12, £8, £4, and £2

1st	No 90	C Bolden, Preston Bissett, Buckingham, "Pundit of Preston" (17,156)
2nd	No 94	Laurence Johnston of Sands, Kincardine on Forth, "Buttrick" (17,156)
3rd	No 97	George R Sharp, Bardmill, Blackford, "Klondyke of The Burn" (17,308)
4th	No 99	Wm Wilson, Coyachie and Drumfergus, Gartly, "Statesman" (17,308)
V	No 96	W A Orr Paterson, Gadguth, Annbank Station, Ayrshire, "Primate of Dalmeny" (17,070)
H	No 95	Wm Mathison, Shoestanes, Heriot, "Leader of Dalmeny" (16,777)
C	No 92	George Bruce, Lochineal, Cullen, N B, "Renown of Lochineal" (17,182)

*Best Cow of any age in Class 10—Ballindalloch Challenge Cup, value £50,
given by the late Mr C Macpherson Grant of Drumduan*

No 106 Her Majesty The Queen, Abergeldie Mains, Ballater, "Princess Irene" (22,586)

Breeder of the Winner of the Ballindalloch Challenge Cup—Silver Medal

Her Majesty The Queen, Abergeldie Mains, Ballater

CLASS 10 COW, of any age —Premiums, £12, £8, £4, and £2

1st	No 109	Thomas Smith Powrie, Dundee, "Stumpie 29th" (21,065)
2nd	No 111	George Willsher, Pitpointie, Dundee, "Black Victoria" (23,461)
3rd	No 101	W S Ferguson, Knochtry, Coupar Angus, "Rose Bruce" (22,868)

- 4th. No. 104. J. & W. Meiklem, Begg, Kirkcaldy, "Makine" (16,519).
 V. No. 108. Thomas Smith, Powrie, Dundee, "Witch of Endor 25th" (22,348).
 H. No. 107. Gordon Reid Shiach, Morriston, Elgin, "Sweet Lavender" (26,049).

CLASS 11. HEIFER, calved on or after 1st December 1897.—
 Premiums, £10, £5, £3, and £2.

- 1st. No. 113. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Ellipsis" (26,908).
 2nd. No. 112. T. H. Bainbridge, Eshott Hall, Falton, Northumberland, "Sabrina of Hayston" (27,744).
 3rd. No. 116. Thomas Smith, Powrie, Dundee, "Witch of Endor 36th" (27,544).
 4th. No. 114. Thomas F. Inkson, Kinermory, Aberlour, Strathspey, "Maid of Kinermory 5th" (27,065).
 V. No. 117. George Willsher, Pitpointie, Dundee, "Fos of Pitpointie" (27,759).
 C. No. 115. Her Majesty The Queen, Abergeldie Mains, Ballater, "Gem of Abergeldie" (27,816).

CLASS 12. HEIFER, calved on or after 1st December 1898.—
 Premiums, £10, £5, £3, and £2.

- 1st. No. 131. The Earl of Strathmore, Glamis Castle, Glamis, "Bonnet."
 2nd. No. 132. The Earl of Strathmore, Glamis Castle, Glamis, "Brunhilde."
 3rd. No. 130. The Earl of Strathmore, Glamis Castle, Glamis, "Home Made."
 4th. No. 119. W. S. Ferguson, Kinochtry, Coupar-Angus, "Opening Rose" (28,303).
 V. No. 135. Archibald Whyte, Inverquhar, Kirriemuir, "Maisie May" (29,424).
 H. No. 133. Archibald Whyte, Inverquhar, Kirriemuir, "Neat Nellie" (29,426).
 C. No. 118. W. S. Ferguson, Kinochtry, Coupar-Angus, "Medusa of Kinochtry" (28,302).
 U No. 122. Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Ebb Tide" (28,470).
 C. No. 128. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Lucretia of Dalmeny 3rd" (29,088).
 C. No. 136. George Willsher, Pitpointie, Dundee, "Alicia of Pitpointie" (29,452).

GALLOWAY.

PRESIDENT'S CHAMPION MEDAL for best Galloway.

- No. 159. Sir Robert Jardine of Castlemilk, Bart., Lockerbie, "Nancy Lee 3rd of Castlemilk" (15,019).

Breeder of best Bull of any age in Classes 13, 14, and 15—The Silver Medal.

- No. 139. James Cunningham, Tarbreoch, Dalbeattie.

CLASS 13. BULL, calved before 1st December 1897.—
 Premiums, £15, £10, £5, and £3.

- 1st. No. 139. W. & R. Clark, Culmain, Crocketford, Dumfries, "Cedric 4th of Tarbreoch" (6466).
 2nd. No. 146. Robert Wilson, Kilquhanity Farm, Dalbeattie, "Macdougall 4th of Tarbreoch" (6841).
 3rd. No. 138. The Duke of Buccleuch and Queensberry, K.G., K.T., Drumlanrig Castle, Thornhill, "Barrossa" (6809).
 4th. No. 144. J. & S. Nivison, Lairdlaugh, Dalbeattie, "Queen's Messenger of Castlemilk" (6598).
 V. No. 145. James Wilson, Tundergarth Mains, Lockerbie, "Macdougall of Naworth" (6900).
 H. No. 141. Henry Graham, Quarryhill Farm, Mealsgate, Wigton, "Blackamoor" (6622).
 C. No. 140. Christopher Graham, Harelawhill, Canonbie, "Minotaur" (6620).

CLASS 14. BULL, calved on or after 1st December 1897.—
Premiums, £15, £10, £5, and £3.

- 1st. No 147. Robert Graham, Kirkconnel, Castle-Douglas, "Gay Stanley" (7122).
2nd No 149. William Parkin-Moore, Whitehall, Mealsgate, Carlisle, "Mac Douglas of Whitehall" (7070)
3rd. No. 148. Robert Jefferson, Rothersyke, Egremont, Cumberland, "Juryman" (7065).
4th No. 150. Robert Wilson, Kilquhanity Farm, Dalbeattie, "Lord William of Durhamhill" (7108)

CLASS 15. BULL, calved on or after 1st December 1898.—
Premiums, £12, £8, £4, and £2.

- 1st No 152. David Brown, Lower Stepford, by Auldgirth, Dumfries, Galloway, "Camp Follower of Stepford" (7476).
2nd No 151. Thomas Biggar & Sons, Chapelton, Dalbeattie, "Mackenzie of Lochokit" (7382)
3rd No 153. Henry Graham, Quarryhill Farm, Mealsgate, Wigton, "The Scot" (7461)
4th No 156. James Wilson, Tundergarth Mains, Lockerbie, "General White" (7474).

CLASS 16. COW, of any age.—Premiums, £12, £8, £4, and £2.

- 1st No 159. Sir Robert Jardine of Castlemilk, Bart, Lockerbie, "Nancy Lee 3rd of Castlemilk" (15,019)
2nd. No. 162. Robert Wilson, Kilquhanity Farm Dalbeattie, "Maggie 10th of Tarbreoch" (14,747)
3rd No 160. Robert Jefferson, Rothersyke, Egremont, Cumberland, "Lady Nancy 4th" (13,870)
4th No 158. Christopher Graham, Harelawhill, Canonbie, "Jane Stanley 4th" (14,777)
V. No 157. The Duke of Buccleuch and Queensberry, K G, K T, Drumlanrig Castle, Thornhill, "Amelia 2nd of Drumlanrig" (14,660)

CLASS 17. HEIFER, calved on or after 1st December 1897 —
Premiums, £10, £5, £3 and £2

- 1st No 169. Robert T. Scott, Drumhughry, Corsock, Dalbeattie "Bell 13th of Drumhughry" (15,540)
2nd No 168. Robert T. Scott, Drumhughry, Corsock, Dalbeattie, "Bell 12th of Drumhughry" (15,539)
3rd No 171. James Wilson, Tundergarth Mains Lockerbie, "Cherry 2nd of Tundergarth Mains" (15,774)
4th No 164. Thomas Biggar & Sons, Chapelton, Dalbeattie, "Lady Stanley 10th of Chapelton" (15,432).
V. No 170. James Wilson, Tundergarth Mains, Lockerbie, "Tidy 2nd of Tundergarth Mains" (15,776)
H No 163. Thomas Biggar & Sons, Chapelton, Dalbeattie, "Bonnie Jean 2nd" (15,435).
C No 165. The Duke of Buccleuch and Queensberry, K G, K T, Drumlanrig Castle, Thornhill, "Flirt 8th of Drumlanrig" (15,395)

CLASS 18. HEIFER, calved on or after 1st December 1898.—
Premiums, £10, £5, £3, and £2.

- 1st No 177. Sir Robert Jardine of Castlemilk, Bart, Lockerbie, "Lady Lee of Castlemilk" (15,910).
2nd No 183. Robert Wilson, Kilquhanity Farm, Dalbeattie, "Maggie of Kilquhanity" (16,295)
3rd No 180. William Parkin Moore, Whitehall, Mealsgate, Carlisle, "Dame Tidy of Whitehall" (15,921)
4th. No 176. Christopher Graham, Harelawhill, Canonbie, "Christmas 2nd of Harelawhill" (15,928).
V No 174. The Duke of Buccleuch and Queensberry, K G K.T, Drumlanrig Castle, Thornhill, "May Queen 4th of Drumlanrig" (15,895)
H. No. 172. William Barbour, Troquharn, New Galloway, "Lady Snowdrop" (15,966).
C. No 173. David Brown, Lower Stepford, by Auldgirth, Dumfries, "Miss Camp Follower of Stepford."

HIGHLAND.

PRESIDENT'S CHAMPION MEDAL for best Highland Animal.

No. 191. The Duke of Atholl, K.T., Blair Castle, Blair Atholl, "Calum Buidhe of Atholl."

Breeder of best Bull of any age in Classes 19, 20, and 21—The Silver Medal.

No. 191. The Duke of Atholl, K.T., Blair Castle, Blair Atholl.

CLASS 19. BULL, calved before 1898.—Premiums, £15, £10, £5, and £3.

- 1st. No. 186. Thomas Valentine Smith of Ardtornish, Morvern, R.S.O., "Victor XVI." (1427).
- 2nd. No. 187. Representatives of the late John Stewart of Ensay, Obbe, "Rhu-na-Searbh" (1410).
- 3rd. No. 185. A. D. & D. M'Gregor, Kinlochmoidart, Fort William, "Iain of Ardanaiseig" (1384).
- 4th. No. 188. Lord Willoughby de Eresby, Glenartney Forest, Connie, "Ailean-a-Braigh."
- V. No. 184. Donald Graham, Airthrey Castle, Bridge of Allan, "Forraquhue" (1365).

CLASS 20. BULL, calved in 1898. Premiums, £15, £10, £5, and £3.

- 1st. No. 191. The Duke of Atholl, K.T., Blair Castle, Blair Atholl, "Calum Buidhe of Atholl."
- 2nd. No. 194. Representatives of the late John Stewart of Ensay, Obbe, "Ben Dianabheg."
- 3rd. No. 193. J. R. Moreton Macdonald of Largie, Largie Castle, Tayinloan, Argyllshire, "Raoghal Riabhach na-Laragaidh."
- 4th. No. 189. John Stirling Ainsworth of Ardanaiseig, Kilchrenan, "An' Sergeant II."
- V. No. 196. Archibald Turner, Kilchamaig, Whitehouse, Argyll, "Oigfhear of Kilchamaig."
- H. No. 192. Marquis of Breadalbane, K.G., Taymouth Castle, Aberfeldy, "Calum Riabhach of Garbole."

CLASS 21. BULL, calved in 1899.—Premiums, £12, £8, £4, and £2.

- 1st. No. 200. The Duke of Atholl, K.T., Blair Castle, Blair Atholl, "Ossian Riabhach of Atholl."
- 2nd. No. 201. John S. Blair, Melfort, Kilmelford, "Dundonald."
- 3rd. No. 211. Thomas Valentine Smith of Ardtornish, Morvern, R.S.O., "Victor XXI." (1600).
- 4th. No. 202. Marquis of Breadalbane, K.G., Taymouth Castle, Aberfeldy, "Schiehallion."
- V. No. 205. Sir Donald Currie, G.C.M.G., M.P., Garth, Aberfeldy, "Donacha-Heanachinn."
- H. No. 198. John Stirling Ainsworth of Ardanaiseig, Kilchrenan, "Rob Riabhach of Ardanaiseig."

CLASS 22. COW, of any age, in Milk, or with Calf at Foot.—Premiums, £12, £8, £4, and £2.

- 1st. No. 214. George Bullough, Rum, by Oban, "Rhouma" (3928).
- 2nd. No. 222. Thomas Valentine Smith of Ardtornish, Morvern, R.S.O., "Sgiathach XXI." (4228).
- 3rd. No. 224. Representatives of the late John Stewart of Ensay, Obbe, "Laoghag Bhuidhe I." (4289).
- 4th. No. 221. The Countess Dowager of Seafield, Castle Grant, Grantown-on-Spey, "Tina II. of Seafield" (4207).
- V. No. 219. Lord Malcolm of Poltalloch, Lochgilphead, "A' Bhanarach Og."
- H. No. 217. A. D. & D. M'Gregor, Kinlochmoidart, Fort William, "Bhan-a-Mhuileach IV. of Kinlochmoidart" (3658).
- C. No. 213. John S. Blair, Melfort, Kilmelford, "Maggie of Melfort" (3493).

CLASS 23. HEIFER, calved in 1897.—Premiums, £10, £5, £3, and £2.

- 1st. No. 228. Thomas Valentine Smith of Ardtornish, Morvern, R.S.O., "Sgiathach XXIV."
 2nd. No. 229. Thomas Valentine Smith of Ardtornish, Morvern, R.S.O., "Cruinneag VI. of Ardtornish."
 3rd. No. 227. The Countess Dowager of Seafield, Castle Grant, Grantown-on-Spey, "Riabhach Mhor of Seafield."
 4th. No. 226. The Countess Dowager of Seafield, Castle Grant, Grantown-on-Spey, "Leila Lee of Seafield."
 V. No. 225. F. Morgan of Glengorm, Tobermory, Mull, "Rosie Bhoideach of Glengorm."
 H. No. 230. John Stewart, Bochastle, Callander, "Proisag Riabhach III."

CLASS 24. HEIFER, calved in 1898.—Premiums, £10, £5, £3, and £2.

- 1st. No. 231. John S. Blair, Melfort, Kilmelford, "Moay of Melfort."
 2nd. No. 237. Thomas Valentine Smith of Ardtornish, Morvern, R.S.O., "Sgiathach XXVI."
 3rd. No. 236. Thomas Valentine Smith of Ardtornish, Morvern, R.S.O., "May Queen V."
 4th. No. 233. George Bullough, Rum, by Oban, "Sonsaig of Rum."
 V. No. 232. John S. Blair, Melfort, Kilmelford, "Ester."
 H. No. 235. Frederick Morgan of Glengorm, Tobermory, Mull, "Caileag Reabhach of Glengorm."
 C. No. 238. John Stewart, Bochastle, Callander, "Lily Bhuidhe III."

EXTRA STOCK.

CLASS 25. HIGHLAND BULLOCK STIRK, calved after 1st January 1899.—Premiums, £8, £6, £4, and £2, given by Lord Malcolm and Mr T. V. Smith of Ardtornish.

- 1st. No. 242. Colonel Cheape, Wellfield, Gateside, N.B., "Mac."
 2nd. No. 243. Colonel Cheape, Wellfield, Gateside, N.B., "Bobs."
 3rd. No. 247. A. D. & D. M'Gregor, Kinlochmoidart, Fort William, "Callum Ruadh."
 4th. No. 248. A. D. & D. M'Gregor, Kinlochmoidart, Fort William, "Paraig Ruadh."
 V. No. 241. John S. Blair, Melfort, Kilmelford, "Bobs."
 H. No. 252. Lord Malcolm of Poltalloch, Lochgilphead, "Bonnie Boy."
 C. No. 256. Thomas Valentine Smith of Ardtornish, Morvern, R.S.O., "Thomas."

AYRSHIRE.

PRESIDENT'S CHAMPION MEDAL for best Ayrshire.

- No. 273. William Howie, Burnhouses, Galston, "White Rose 2nd" (12,052).

Breeder of best Bull of any age in Classes 26, 27, and 28—The Silver Medal.

- No. 258. Sir Mark J. M'Taggart Stewart of Southwick, Bart., M.P., Dumfries.

CLASS 26. BULL, calved before 1898.—Premiums, £12, £8, and £4.

- 1st. No. 258. Andrew Mitchell, Barcheskie, Kirkcudbright, "Commander" (3762).
 2nd. No. 259. Robert Wardrop, Garlaff, Cumnock, "Darnley" (3599).
 3rd. No. 257. William M'Queen, Shirgarton, Kippen, Stirling, "The Provost."

CLASS 27. BULL, calved in 1898.—Premiums, £12, £8, and £4.

- 1st. No. 263. Robert Wardrop, Garlaff, Cumnock, "Strongbow" (4338).
 2nd. No. 260. Thomas Barr, Monkland, Kilmarnock, "The General" (4314).
 3rd. No. 262. James M'Farlane, Oxhill, Bucklyvie, "Governor of Palmerston" (4336).
 H. No. 261. Duncan Fraser, Dalmally Hotel, Dalmally, "Sirdar of Netherhall" (193).

CLASS 28. BULL, calved in 1899.—Premiums, £8, £5, and £3.

- 1st. No. 266. G. J. Fergusson-Buchanan of Auchentorlie, Bowling, "Prince George" (4391).
 2nd. No. 267. James Howie, Hillhouse, Kilmarnock, "Go Ahead."
 3rd. No. 268. James Howie, Hillhouse, Kilmarnock, "Not Likely."
 V. No. 265. Crichton Royal Institution, Crichton Farm, Dumfries, "General White" (4250).
 H. No. 264. Thomas Barr, Monkland, Kilmarnock, "Viceroy."
 C. No. 269. James M'Farlane, Oxhill, Bucklyvie, "Belted Knight."

CLASS 29. COW, calved before 1897, in Milk.—Premiums, £10, £7, and £3.

- 1st. No. 273. William Howie, Burnhouses, Galston, "White Rose 2nd" (12,052).
 2nd. No. 274. John M'Kay, Barone Park, Rothesay, "Beauty."

CLASS 30. COW, calved in 1897, in Milk.—Premiums, £10, £7, and £3.

- 1st. No. 278. Alexander Cross of Knockdon, Maybole, "Sonsy 2nd" (11,173).
 2nd. No. 279. Charles Duncan, Little Kilmory, Rothesay, "Snowdrop."
 3rd. No. 280. Charles Kay, Mill Farm, Gargunnoch, "Ladysmith."
 V. No. 286. Thomas Brown, Drum Farm, Thornhill, Dumfriesshire, N.B., "Regina."
 H. No. 284. M. C. Stark, Westerton Donne, Donne, "Shrine 3rd of Westerton" (13,270).

CLASS 31. COW of any age, in Calf, or HEIFER calved in 1897, in Calf and due to calve within nine months after the Show.—Premiums, £10, £7, and £3.

- 1st. No. 291. William Reid, Titwood, Mearns, "Dandy of Titwood."
 2nd. No. 287. Robert Dawson, Dovehill, Pollokshaws, "Pride of Bute."
 3rd. No. 290. John M'Kay, Barone Park, Rothesay, "Hilda."
 V. No. 288. Abram Kerr, Old Graitney, Gretna, "Martha of Old Graitney."
 H. No. 272. Alexander Cross of Knockdon, Maybole, "Mysie 2nd of Springs" (12,099).
 C. No. 276. Alexander Cross of Knockdon, Maybole, "Rosalind 2nd" (11,165).
 C. No. 289. John M'Alister, Arlyne, Toward, "Whitelegs."

CLASS 32. HEIFER, calved in 1898.—Premiums, £10, £5, and £3.

- 1st. No. 293. G. J. Fergusson-Buchanan of Auchentorlie, Bowling, "Snowdrop of Auchentorlie" (12,835).
 2nd. No. 295. Robert Wardrop, Garlaiff, Cumnock, "Ellen Terry."
 3rd. No. 294. Andrew Mitchell, Barcheskie, Kirkcudbright, "Mary" (13,167).
 V. No. 292. Thomas Barr, Monkland, Kilmarnock, "Princess of Monkland."

CLASS 33. HEIFER, calved in 1899.—Premiums, £8, £5, and £3.

- 1st. No. 297. James Howie, Hillhouse, Kilmarnock, "Queen Jessie."
 2nd. No. 296. Thomas Barr, Monkland, Kilmarnock, "Pandora."
 3rd. No. 299. Andrew Mitchell, Barcheskie, Kirkcudbright, "Queen Vashti."
 V. No. 298. Andrew Mitchell, Barcheskie, Kirkcudbright, "Queen Esther."

JERSEY.

PRESIDENT'S CHAMPION MEDAL for best Jersey.

- No. 306. T. R. B. Elliot, yr. of Clifton Park, Kelso, "Daisy."

CLASS 34. BULL, any age.—Premiums, £10, £5, and £3.

- 1st. No. 303. Earl of Hopetoun, Hopetoun House, South Queensferry, "Beresford Hope."
 2nd. No. 302. Mrs Graham, Airthrey Castle, Bridge of Allan, "Sailor King."
 3rd. No. 301. T. R. B. Elliot, yr. of Clifton Park, Kelso, "Golden Ray."
 V. No. 300. Marquis of Breadalbane, K.G., Taymouth Castle, Aberfeldy, "Gloamin."

CLASS 35. COW, in Milk, calved before 1898 —Premiums, £10, £5, and £3.

- 1st No 306 T. R. B. Elliot, yr of Clifton Park, Kelso, "Daisy"
 2nd. No 308 Earl of Hopetoun, Hopetoun House, South Queensferry, "Eugenie Beresford"
 3rd No 309 Earl of Hopetoun, Hopetoun House, South Queensferry, "Cranberry."
 V No 310 T. E. Lander, Colzium House Kilsyth, "Gloire de Dijon"
 H No 307 T. R. B. Elliot, yr of Clifton Park, Kelso, "Grey Lady"
 C. No 304 Marquis of Breadalbane, K.G., Taymouth Castle, Aberfeldy, "Blossom"
 C No 311 T. E. Lander, Colzium House, Kilsyth, "Gloire de Dijon 2nd."

CLASS 36 COW, in Milk, or HEIFER in Calf, calved in 1898 — Premiums, £10, £5, and £3

- 1st No 312 T. R. B. Elliot, yr of Clifton Park, Kelso, "Twinkle"

CLASS 37 HEIFER, calved in 1899 —Premiums, £8, £4, and £2

- 1st. No 317 Earl of Hopetoun, Hopetoun House, South Queensferry, "Beresford Fairy"
 2nd No. 315 T. R. B. Elliot, yr of Clifton Park, Kelso, "Grey Queen"

EXTRA CATTLE.

The following has been Very Highly Commended and a Medium Silver Medal awarded

- No 320 Sir John Gilmour of Lundin and Montrave, Bart, Leven, Fife, Cross Bullock (Shorthorn Bull and Galloway Cow)

The following has been Highly Commended and a Medium Silver Medal awarded.

- No 321 Sir John Gilmour of Lundin and Montrave, Bart, Leven, Fife, Cross Heifer (Shorthorn Bull and Galloway Cow)

The following have been Commended and Bronze Medals awarded

- No 318 Sir John Gilmour of Lundin and Montrave, Bart, Leven, Fife, Cross Heifer (Shorthorn Bull and Aberdeen Angus Cow)
 No 319 Sir John Gilmour of Lundin and Montrave, Bart, Leven, Fife, Cross Bullock (Shorthorn Bull and Aberdeen Angus Cow)

HORSES

FOR AGRICULTURAL PURPOSES.

DRAUGHT STALLIONS

PRESIDENT'S CHAMPION MEDAL for best Clydesdale Stallion.

- No 329 A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Prince Thomas" (10,262)

Breeder of best Male Animal of any age in Classes 38 to 41—The Silver Medal

- No. 329 The Marquis of Londonderry, K.G., Seaham Harbour, Sunderland

CLASS 38 STALLION, foaled before 1897.—Premiums, £20, £15, £10, and £4.

- 1st. No 329. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Prince Thomas" (10,262)
 2nd. No 335 Herbert Webster, Morton House, Fence Houses, "Lord Fauntleroy" (10,370)
 3rd. No 324 John Crawford, Manrahead, Beith, "Casablanca" (10,523)
 4th No. 332. Walter S. Park, Hatton, Bishopton, "Lothian's Best" (10,374).
 V. No. 331 A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Elator" (10,340)

CLASS 39. ENTIRE COLT, foaled in 1897.—Premiums, £20, £15, £10, and £4.

- 1st. No. 345. Thomas Smith, Blaon Point, Chester, "Drumflower" (10,537).
- 2nd. No. 346. Herbert Webster, Morton House, Fence Houses, "Baron Kitchener" (10,499).
- 3rd. No. 337. James Kilpatrick, Craigie Mains, Kilmarnock, "Royal Gartly's Heir" (10,631).
- 4th. No. 339. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Fickle Fashion" (10,546).
- V. No. 344. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Rozelle" (10,638).
- H. No. 351. R. Macfarlane, Tomich, Invergordon, "Carbineer" (10,522).
- C. No. 340. A. & W. Montgomery, Netherhall, Castle-Douglas, "Lord Forester" (10,583).

CLASS 40. ENTIRE COLT, foaled in 1898.—Premiums, £20, £12, £8, and £4.

- 1st. No. 364. Herbert Webster, Morton House, Fence Houses, "Baron's Crown" (10,679).
- 2nd. No. 347. William Clark, Netherlea, Cathcart, "Pride of Blaon" (10,837).
- 3rd. No. 354. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Concord" (10,720).
- 4th. No. 353. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Baron Mitchell" (10,684).
- V. No. 358. Seaham Harbour Stud Co., Ltd., Seaham Harbour, "Pearl Oyster" (10,831).
- H. No. 355. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright, "Pride of Morning" (10,838).
- C. No. 356. Walter S Park, Hatton, Bishopston, "Sir Everest" (10,917).

CLASS 41. ENTIRE COLT, foaled in 1899.—Premiums, £15, £10, £6, and £4.

- 1st. No. 373. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright.
- 2nd. No. 370. James Kilpatrick, Craigie Mains, Kilmarnock, "Lord Dundonald."
- 3rd. No. 372. David Mitchell of Millfield, Polmont, "Baronson."
- 4th. No. 371. Robert Macfarlane, Tomich, Invergordon, "Kildonan."
- V. No. 375. A. & W. Montgomery, Netherhall and Banks, Kirkcudbright.
- H. No. 380. The Earl of Strathmore, Glamis Castle, Glamis.

DRAUGHT GELDINGS.

PRESIDENT'S CHAMPION MEDAL for best Draught Gelding.

- No. 391. William Clark, Netherlea, Cathcart, "Perfection."

CLASS 42. DRAUGHT GELDING, foaled before 1897.—
Premiums, £10, £5, and £3.

- 1st. No. 386. David Hastie & Sons, Stonefield Farm, Blantyre, "Johnnie."
- 2nd. No. 383. William Clark, Netherlea, Cathcart, "Wattie."
- 3rd. No. 381. Robert Buchanan, Blairquhosh, Strathblane, "Blane."
- V. No. 388. R. Sinclair Scott, Flatt Farm, Largs, Ayrshire, "Royal Clyde."
- H. No. 387. John M'Nah, Swinton House, Coldstream, "Ben."

CLASS 43. DRAUGHT GELDING, foaled in 1897 —Premiums, £6, £4, and £3.

- 1st. No. 391. William Clark, Netherlea, Cathcart, "Perfection."
- 2nd. No. 392. David Hastie & Sons, Stonefield Farm, Blantyre, "The Wanderer."
- 3rd. No. 397. William Wallace, Mauchline, Ayrshire, "Darnhay."
- H. No. 395. George R. Sharp, Bardrill, Blackford, "Powell."
- C. No. 396. William Tod, Pardovan, Philpstoun.

CLASS 44. DRAUGHT GELDING, foaled in 1898. —Premiums, £6, £4, and £3.

- 1st. No. 398. William Clark, Netherlea, Cathcart, "Gallant."
- 2nd. No. 400. David Hastie & Sons, Stonefield Farm, Blantyre, "Peter."

DRAUGHT MARES AND FILLIES.

PRESIDENT'S CHAMPION MEDAL for best Clydesdale Mare or Filly.

No. 414. Herbert Webster, Morton House, Fence Houses, "Lady Lothian" (13,819).

Best Mare or Filly registered in the Clydesdale Stud Book—Cawdor Challenge Cup, value 50 guineas, given by the Clydesdale Horse Society.

No. 414. Herbert Webster, Morton House, Fence Houses, "Lady Lothian" (13,819).

Breeder of Best Clydesdale Brood Mare—The Robert Murdoch Prize of £10.

No. 405. Robert Raffan, Knowlsmoor, Fordyce, Banffshire.

CLASS 45. MARE, of any age, with Foal at foot.—
Premiums, £20, £12, £7, and £4

- 1st No. 405. Ralph Holwes, Whitburn Moors, Sunderland, "Lady Raffan" (13,933).
2nd No. 407. J. & W. Meiklem, Begg, Kirkcaldy, "Lady Summit" (13,960).
3rd No. 408. Wm Park, Brunstane, Portobello, "Lady Rose."
4th No. 410. Seaham Harbour Stud Co, Ltd., Seaham Harbour, "High Tide" (12,821).
V. No. 412. Thomas Smith, Blacon Point, Chester, "Orphan Princess" (13,281).
H. No. 404. Andrew Dewar, Arnprior, Port of Monteith Station, "Arnprior Queen"
C. No. 403 The Earl of Derby, K G., Knowsley, Prescot, "Miss Warden" (13,246).

CLASS 46. YELD MARE, foaled before 1897 —Premiums, £12, £9, £6, and £4.

- 1st No. 418. Sir John Gilmour of Montrave, Bart, Leven, "Balmedie Queen Mab" (13,518).
2nd No. 425. Thomas Smith, Blacon Point, Chester, "Belle of Fashion" (12,924).
3rd No. 424. Seaham Harbour Stud Co, Ltd, Seaham Harbour, "Essence" (13,907).
4th No. 419. Sir John Gilmour of Montrave, Bart, Leven, "Montrave Rowena" (13,818).
V. No. 417 St Clair Cunningham, Hedderwick Hill, "Minnic of Walkinshaw"
H. No. 416. G & J. Cocker, Hill of Petty, Fyvie, "Lady Douglas."
C. No. 426. Herbert Webster, Morton House, Fence Houses, "Lady Lockhart" (13,318).

CLASS 47. YELD MARE or FILLY, foaled in 1897.—
Premiums, £12, £9, £6, and £4.

- 1st No. 437 Thomas Smith, Blacon Point, Chester, "Jeannie Deans"
2nd No. 435. The Earl of Rosebery, K G, Dalmeny Park, Edinburgh, "Princess of Glasnick."
3rd No. 427. St Clair Cunningham, Hedderwick Hill, Dunbar, "Maggie Holmes"
4th No. 434. Robert Paterson, Hill of Drip, Stirling, "Lady Garnet."
V. No. 431. James F Murdoch, East Hallside, Newton, "Lady Roberts"
H. No. 438. John Weir, Townhead Farm, Lanark, "Baron's Queen"
C. No. 428. Richard Dunn, Udston, Hamilton, "Ringlet."

CLASS 48. FILLY, foaled in 1898.—Premiums, £12, £9, £6, and £4.

- 1st No. 446. Alexander Guild, W S., Aberlady Mains, Aberlady, "Jopsy Pride"
2nd No. 454 R. Sinclair Scott, Flatt Farm, Largs, Ayrshire, "Scottish Baroness."
3rd No. 456. Thomas Smith, Blacon Point, Chester, "Cedric Princess."
4th No. 441. Wm. Clark, Wester Bogie, Kirkcaldy, "Beauty's Queen"
V. No. 449. H. B Marshall, Rachan, Broughton, Peeblesshire, "Mimosa"
H. No. 455. John Weir, Townhead Farm, Lanark, "Clarinda"
G. No. 439. George Alston, Loudon Hill Darvel, "Mecsalina"
C. No. 447. John Lamont, Toward Farm, Toward, "Princess Shapely."

CLASS 49. FILLY, foaled in 1899.—Premiums, £12, £9, £6, and £4.

- 1st. No. 470. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh, "Pomona."
- 2nd. No. 461. William Dunlop, Dunure Mains, Ayr, "Nancy Young."
- 3rd. No. 460. St Clair Cunningham, Hedderwick Hill, Dunbar, "White Heather."
- 4th. No. 465. James Gray, Birkenwood, Gargunnoch, "Baron's Blossom."
- V. No. 467. William T. Malcolm, Dunmore Home Farm, Larbert, "Princess Gertrude."
- H. No. 471. R. Sinclair Scott, Flatt Farm, Largs, Ayrshire, "Scottish Grace."
- C. No. 459. John Craig, Bellsfield House, Blantyre, "Lady Peggie."
- C. No. 466. William M'Keich, Woodend, Bucklyvie, "Lady Ross."

HUNTERS.

PRESIDENT'S CHAMPION MEDAL for best Hunter.

- No. 496. Edward Hoyle, Moorlands, Bacup, Mare, "Countess" (2246).

Best Hunter Filly in Classes 50, 51, and 52—Gold Medal, value £10, 10s., given by the Hunter Improvement Society.

- No. 488. David Deuchar, Low Buston, Warkworth, Filly, "Laughing Girl."

CLASS 50. COLT, GELDING, or FILLY, foaled in 1899, the produce of thoroughbred Stallions, out of Mares of any breed.—Five Prizes—£10, £7, £5, £2, and £1, given by Sir John Gilmour of Montrave, Bart.

- 1st. No. 479. J. Harling Turner, Cessnock, Galston, Gelding, "Cessnock."
- 2nd. No. 475. John Cairns, Belhie, Auchterarder, Filly, "Lady Peggy."
- 3rd. No. 477. David Deuchar, Low Buston, Warkworth, Colt, "Laughing Boy."
- 4th. No. 478. Edward Hoyle, Moorlands, Bacup, Colt, "Rosebery."
- 5th. No. 480. J. Harling Turner, Cessnock, Galston, Filly, "Clipstone."

CLASS 51. FILLY, MARE, or GELDING, for field, foaled in 1898, *in hand*.—Premiums, £8, £5, and £3.

- 1st. No. 485. J. Harling Turner, Cessnock, Galston, Gelding, "Crossburn."
- 2nd. No. 483. J. Stewart Lyon, Kirkmichael, Dunfries, Gelding.
- 3rd. No. 482. Robert Brown, Craighead, Bothwell, Gelding, "York."

CLASS 52. YELD MARE, FILLY, or GELDING, for field, foaled in 1897, *in hand*.—Premiums, £8, £5, and £3.

- 1st. No. 488. David Deuchar, Low Buston, Warkworth, Filly, "Laughing Girl."
- 2nd. No. 489. Edward Hoyle, Moorlands, Bacup, Gelding, "Sirdar."
- 3rd. No. 491. David Mitchell of Millfield, Polmont, Gelding, "Julius."

CLASS 53. MARE or GELDING, foaled before 1st January 1897, able to carry over 13 stone 7 lb., *in saddle*.—Premiums, £20, £10, and £5.

- 1st. No. 496. Edward Hoyle, Moorlands, Bacup, Mare, "Countess" (2246).
- 2nd. No. 497. William Taylor, Park Mains, Renfrew, Gelding, "Experience."
- 3rd. No. 494. Frank Dunne, Wetheral, Carlisle, Gelding, "Warwick."

CLASS 54. MARE or GELDING, foaled before 1st January 1897, able to carry any weight up to 13 stone 7 lb., *in saddle*.—Premiums, £15, £8, and £4.

- 1st. No. 499. Fred Usher, Norton Mains, Ratho Station, Gelding, "Calder."
- 2nd. No. 498. Edward Hoyle, Moorlands, Bacup, Mare, "Lady Gordon."

CLASS 55. HUNTER, BROOD MARE, with Foal at foot, or to foal this season.—Premiums, £15, £8, and £4, given by Captain Clayhills Henderson of Invergowie, R.N.

- 1st. No. 503. Sir Reginald H. A. Ogilvy of Inverquhar, Bart., Baldovan House, Strathmartine, "Mayflower" (953).
- 2nd. No. 502. James Moffat, Whitehaugh, Hawick, "Music."
- 3rd. No. 500. Duncan M'Laren, Sauchie Home Farm, Stirling, "Betsy."

HACKNEYS.

(ALL TO BE SHOWN IN HAND.)

PRESIDENT'S CHAMPION MEDAL for best Hackney.

No. 532. Charles E Galbraith, Terregles, Dumfries, "Atbara" (6964).

Best Mare or Filly in Hackney or Pony Classes—Gold Medal, value £10, given by the Hackney Horse Society.

No. 520. David Mitchell of Millfield, Polmont, "Filberta" (12 627).

CLASS 56. BROOD MARE, 15 hands and upwards, with Foal at foot, or to foal this season to a registered sire. Registered in the Hackney Stud-Book.—Premiums, £10, £6, and £4.

1st. No 504 Charles E. Galbraith, Terregles, Dumfries "Vivandiere" (10,589).

2nd No 505 David Mitchell of Millfield, Polmont, "Sabina" (9496)

CLASS 57. BROOD MARE, under 15 hands, with Foal at foot, or to foal this season to a registered sire Registered in the Hackney Stud Book.—Premiums, £10, £6, and £4.

1st. No 511. Charles E Galbraith, Terregles, Dumfries, "Trilby" (10,568)

2nd. No. 512 Charles E Green, The Hollies, Gordon Terrace, Edinburgh, "Dawn" (12,572)

3rd. No 509. Mackenzie Fraser, Castle Fraser, Kenmay, Aberdeenshire, "Lady Alice" (1170).

C. No 508. Robert Chapman, Glenboig, "Bonnie Norah" (9761).

CLASS 58 YELD MARE or FILLY, foaled in 1897 Registered in the Hackney Stud-Book —Premiums, £8, £5, and £3

1st No 513 Charles E Galbraith, Terregles, Dumfries, Filly, "Atalanta" (11,620)

2nd. No 514 Charles E Galbraith, Terregles, Dumfries, Filly, "Miss Nancy" (12,143)

3rd. No. 516. Thomas Neill, Shawhill, Hurlford, N B, Filly, "Mylmead" (12,100).

CLASS 59. FILLY, foaled in 1893. Registered in the Hackney Stud-Book — Premiums, £8, £5, and £3

1st No 520. David Mitchell, of Millfield, Polmont, "Filberta" (12,627)

2nd No. 519 Charles E. Galbraith, Terregles, Dumfries, "Lady Katharine" (12,818)

CLASS 60 FILLY, foaled in 1899, eligible for entry in the Hackney Stud-Book — Premiums, £8, £5, and £3.

1st No 527. Hon. Mrs Vernon, Auchans Kilmainnock "Rosette."

2nd. No 526 David Mitchell, of Millfield, Polmont, "Rosabest"

3rd No 528 Charles E Galbraith, Terregles, Dumfries, "Lexy"

H No. 525 Robert C Marshall, Burntsields, Kilbarchan

C No. 524 Robert C. Marshall, Burntsields, Kilbarchan

CLASS 61 STALLION, foaled in or before 1897, over 15 hands. Registered in the Hackney Stud Book —Premiums, £10, £6, and £4.

1st. No 528. Sir Robert Moncreiffe, Bart, of Moncreiffe, Bridge of Earn, "Moncreiffe Statesman" (7192)

CLASS 62. STALLION, foaled in or before 1897, over 14 and not over 15 hands. Registered in the Hackney Stud-Book.—Premiums, £10, £6, and £4.

1st. No. 530. George R Watson, Parkhead Cross, Glasgow, "Hedon Sensation" (6042)

2nd No. 529. C S Fletcher, The Grange, Angram, York, "Grand Connaught 2nd" (6391)

CLASS 63. ENTIRE COLT, foaled in 1898. Registered in the Hackney Stud Book.
—Premiums, £8, £5, and £3.

- 1st. No. 532 Charles E Galbraith, Terregles, Dumfries, "Atbara" (6964)
2nd. No. 533. F. Stephen, Helenslea, Broughty Ferry, "Gay Rosador" (7089)
3rd. No. 531. J. Harriott Bell, Rossie, Forganenny, "Rossie Matchless" (7241).

CLASS 64. ENTIRE COLT, foaled in 1899, eligible for entry in Hackney
Stud-Book.—Premiums, £8, £5, and £3

- 1st. No. 534. Mackenzie Fraser, Castle Fraser, Kenmay, Aberdeenshire "Con-
naught Boy."
2nd. No. 535. David Mitchell of Millfield, Polmont, "Ganyden "

PONIES.

PRESIDENT'S CHAMPION MEDAL for best Pony.

No 544. Andrew Wilson, North Mains, Stepps, near Glasgow, Mare, "Twinkle."

CLASS 65. STALLION, 3 years old and upwards, over 12, not exceeding
14 hands, *in hand*.—Premiums, £5, £3, and £2.

- 1st No 539. Robert Kirkwood, Camelon, Falkirk, "Plough Boy."
2nd No 539 Robert Kirkwood, Camelon, Falkirk, "Little Bobbie "

CLASS 66. YELD MARE, FILLY, or GELDING, 3 years old and upwards, over
13 and not over 14½ hands, *in saddle*.—Premiums, £5, £3, and £2.

- 1st. No. 544 Andrew Wilson, North Mains, Stepps, near Glasgow, Mare,
"Twinkle "
2nd No 540. J. Harriott Bell, Rossie, Forganenny, Gelding, "Stormer."
3rd No 541 William B Hamilton, Kirklyth, Mare, "Laywood Perfection" (8171)

CLASS 67 YELD MARE, FILLY, or GELDING, 3 years old and upwards, over
12 and not over 13 hands, *in saddle* —Premiums, £5, £3, and £2

- 1st No 546 James Hamilton, Aldersyde, Uddingston, Gelding, "Harum's Model "

CLASS 68. STALLION, 3 years old and upwards, 12 hands and under,
in hand —Premiums, £5, £3, and £2 —No Entry.

CLASS 69 YELD MARE, FILLY, or GELDING, 3 years old and upwards,
12 hands and under, *in saddle* —Premiums, £5, £3, and £2.

- 1st. No 550 Walter M'Gee, Bridge Street Gram Mills, Paisley, Gelding, "General
Hunter "
2nd No 549 Robert Kirkwood, Camelon, Falkirk, Mare, "Molly "

SHETLAND PONIES

(ALL TO BE SHOWN IN HAND.)

PRESIDENT'S CHAMPION MEDAL for best Shetland Pony.

No. 576 Mrs Wentworth Hope Johnstone, Skeynes, Edenbridge, Kent, Mare,
"Emerald" (1275)

CLASS 70. STALLION, not exceeding 10½ hands, foaled before 1898.—
Premiums, £5, £3, and £2.

- 1st. No. 559 R. W. R. Mackenzie, Earlshall, Leuchars, "Rattles."
2nd. No. 553. Patrick Graham, Kitchside, Busby, "Daniel."
3rd No. 555. Mrs Wentworth Hope Johnstone, Skeynes, Edenbridge, Kent, "San
ballat "
V No 560. George A. Miller, Knowehead, Perth, "Palmer."
H. No. 554. The Ladies E & D Hope, Great Hollenden Farm, Underriver, Seven-
oaks, "Vulcan "
C. No 557. James M'Farlaue, Bernard Cottage, Alva, "Moonstone."

CLASS 71. MARE, not exceeding 10½ hands, with Foal at foot.—
Premiums, £5, £3, and £2.

- 1st. No. 564. John Fulton Christie, Gartlea, Caldarvan, Alexandria, N.B.,
 "Sweetie" (676).
 2nd. No. 565. R. W. R. Mackenzie, Earls hall, Leuchars, "Belle of Bressay" (1192).
 3rd. No. 566. T. R. B. Elliot, yr. of Clifton Park, Kelso, "Berry Beauty."
 C. No. 569. David Sword, Helensfield, Dunblane, "Brenda."

CLASS 72. YELD MARE, FILLY, or GELDING, not exceeding 10½ hands,
foaled before 1898 —Premiums, £5, £3, and £2.

- 1st. No. 576 Mrs Wentworth Hope Johnstone, Skeynes, Edenbridge, Kent, Mare,
 "Emerald" (1275).
 2nd. No. 574. The Ladies E & D Hope, Great Hollenden Farm, Underriver, Seven-
 oaks, Mare, "Sea Serpent."
 3rd. No. 573. The Ladies E & D. Hope, Great Hollenden Farm, Underriver, Seven-
 oaks, Mare, "Vementry II." (1104)
 V. No. 582 R. W. R. Mackenzie, Earls hall, Leuchars, Mare, "Topaz" (1116).
 H. No. 575. Countess of Hopetoun, Hopetoun House, South Queensferry, Mare,
 "Star."
 C. No. 583. R. W. R. Mackenzie, Earls hall, Leuchars, Mare, "Pansy."

CLASS 73. COLT, GELDING, MARE, or FILLY, foaled in 1898 or 1899,
not exceeding 10½ hands.—Premiums, £5, £3, and £2

- 1st. No. 587. Countess of Hopetoun, Hopetoun House, South Queensferry, Mare,
 "Dulcemona."
 2nd. No. 588. George A. Miller, Knowehead, Perth, Filly, "Virginia"
 3rd. No. 589 W. Earl Walker, Thornlea, Gosforth, Northumberland, Colt, "Don
 Alonzo"

*Best Shetland Pony, Stallion, Mare, or Gelding, exhibited in saddle or harness—Silver
 Cup, value £10, 10s, given by Mr R. W. R. Mackenzie, Earls hall, Leuchars.*

- No 576 Mrs Wentworth Hope Johnstone, Skeynes, Edenbridge, Kent, Mare,
 "Emerald" (1275).

*(a) Best piebald or skewbald Shetland Pony, Stallion, Mare, or Gelding, not exceeding
 10½ hands—Piece of Plate, value £4, 4s, given by various contributors, per Mrs
 Hope Johnstone*

- No 558. Mrs Mackenzie, Earls hall, Leuchars, Stallion, "Mighty Atom"

*(b) Shetland Pony, Stallion, Mare, or Gelding, not exceeding 10½ hands, with best
 head, neck, and shoulders—Piece of Plate, value £4, 4s, given by various con-
 tributors, per Mrs Hope Johnstone*

- No 584 R. W. R. Mackenzie, Earls hall, Leuchars, Mare, "Topaz"

*(c) Shetland Pony, Stallion, Mare, or Gelding, not exceeding 10½ hands, with best legs
 and feet—Piece of Plate, value £4, 4s, given by various contributors, per Mrs
 Hope Johnstone*

- No 583. R. W. R. Mackenzie, Earls hall, Leuchars, Mare, "Pansy."

DRIVING COMPETITIONS.

**PRESIDENT'S CHAMPION MEDAL for best animal in the Classes
 for Horses in Harness.**

- No. 601. Alexander Gemmell, Chelston, Ayr, Hackney Mare.

**CLASS 74. YELD MARE, FILLY, or GELDING, in Harness, 15 hands and
 upwards, to be driven in the ring —Premiums, £10, £5, and £3.**

- 1st. No. 599. Andrew Wilson, North Mains, Stepps, near Glasgow, Hackney
 Gelding, "Lord Kilbride" (419).
 2nd. No. 592 Alexander Gemmell, Chelston, Ayr, Hackney Gelding
 3rd. No. 597. I. Ramsay, Kildalton, Islay, Mare, "Lady Helmsley"
 C. No. 593. James Hamilton, Aldersyde, Uddingston, Mare, "Lady Halton."

CLASS 75. YELD MARE, FILLY, or GELDING, in Harness, under 15 hands, to be driven in the ring.—Premiums, £10, £5, and £3.

- 1st. No. 604. Alexander Gemmell, Chelston, Ayr, Hackney Mare.
- 2nd. No. 542. Alexander Morton, Gowanbank, Darvel, Mare, "Contention 2nd" (9824).
- 3rd. No. 606. Walter M'Gee, Bridge Street Grain Mills, Paisley, Mare, "Gold Reef."
- V. No. 540. J. Harriott Bell, Rossie, Forgandenny, Gelding, "Stormer."
- H. No. 608. Wallace Thorneycroft, Rochdale Lodge, Stirling, Mare, "Gipsy."

JUMPING COMPETITIONS

Wednesday, 18th July.

CLASS 1. HORSES, Open.—Premiums, £20, £10, and £5.

1. Mrs Blockley, Madeley, Staffs., Gelding, "Alfred."
2. David Carnegie, East Pitcorthie, Colinsburgh, Gelding, "Black Jock."
3. Thompson & Wheeler, Studley, Gelding, "Red Letter."

CLASS 2. PONIES, 14.3 hands and under.—Premiums, £10, £5, and £3.

1. William Riddick, Crooklake Hall, Wigton, Cumberland, Mare, "Darkie."
2. Thompson & Wheeler, Studley, Gelding, "Laddie."
3. James Nodwell, Dumfries, Mare, "Moderation."

Thursday, 19th July.

CLASS 3. HORSES, Open Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize, in Class 1.—Premiums, £10, £6, and £3.

1. Thompson & Wheeler, Studley, Gelding, "Red Letter."
2. Mrs Blockley, Madeley, Staffs., Gelding, "Alfred."
3. James Nodwell, Dumfries, Gelding, "High Life."

CLASS 4. PONIES, 14.3 hands or under, Handicap, hurdles and gate being raised 4 inches for first-prize winner in Class 2.—Premiums, £5, £3, and £1.

1. William Riddick, Crooklake Hall, Wigton, Cumberland, Mare, "Darkie."
2. James Nodwell, Dumfries, Mare, "Moderation."
3. Thompson & Wheeler, Studley, Gelding, "Laddie."

Friday, 20th July.

CLASS 5. HORSES, Open Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize, in either of Classes 1 or 3—4 inches extra for the winner of the two first prizes in Classes 1 and 3.—Premiums, £10, £6, and £3.

- 1 (equal). { Thompson & Wheeler, Studley, Gelding, "Ladas."
Mrs Blockley, Madeley, Staffs., Gelding, "Alfred."
3. James Nodwell, Dumfries, Gelding, "High Life."

CLASS 6. PONIES, 14.3 hands or under, Handicap, hurdles and gate being raised 4 inches for the winner of the first prize in Class 2 or in Class 4, and 8 inches for winner of the first prize in both these Classes.—Premiums, £5, £3, and £1.

1. William Riddick, Crooklake Hall, Wigton, Cumberland, Mare, "Darkie."
2. Thompson & Wheeler, Studley, Gelding, "Laddie."
3. James Nodwell, Dumfries, Mare, "Moderation."

Champion Prize of £10 for most points in Prizes with one or more Horses in above Classes—First Prize to count three points; Second Prize, two points; and Third Prize, one point. The money to be evenly divided in the event of a tie.

Thompson & Wheeler, Studley.

SHEEP

BLACKFACED

PRESIDENT'S CHAMPION MEDAL for best Pen of Blackfaced Sheep

No 619 Charles Howatson of Glenbuck

Best Five Blackfaced Tups, bred by and never out of the possession of the Exhibitor, in Classes 76 and 77—the Breeders' Prize of £10, given by Mr C. Howatson of Glenbuck.

Charles Howatson of Glenbuck

CLASS 76 TUP, above one Shear—Premiums, £12, £8, £4, and £2

1st	No 619	Charles Howatson of Glenbuck
2nd	No 613	Cadzow Brothers, Borland, Biggar, and Stonehill, Abington, "Shamrock"
3rd	No 625	William Mitchell, Hazelside Douglas "Young Prince"
4th	No 612	Cadzow Brothers, Borland, Biggar, and Stonehill, Abington, "Hawthorn"
V	No 610	J. Archibald, Overshels Stow
H	No 611	J. Archibald, Overshels Stow
C	No 627	James Murray, Low Ploughland, by Darvel

CLASS 77 SHEARLING TUP—Premiums, £12, £8, £4, and £2

1st	No 645	Charles Howatson of Glenbuck
2nd	No 652	Charles Howatson of Glenbuck
3rd	No 647	Charles Howatson of Glenbuck
4th	No 661	James Paton, Alliston, Strathaven
V	No 638	Cadzow Brothers, Borland, Biggar, and Stonehill, Abington
H	No 650	Charles Howatson of Glenbuck
C	No 651	Charles Howatson of Glenbuck

CLASS 78 EWE, above one Shear, with her Lamb at foot—Premiums, £10, £6, and £2

1st	No 668	Charles Howatson of Glenbuck
2nd	No 671	Charles Howatson of Glenbuck
3rd	No 670	Charles Howatson of Glenbuck
V	No 672	A. McRea, Spittal Farm, Lenzie, Glasgow
H	No 669	Charles Howatson of Glenbuck
C	No 667	Jas. Hamilton, Woolfords, Collieston

CLASS 79 SHEARLING LWE or GIMMER—Premiums, £10, £5, and £2

1st	No 675	Cadzow Brothers, Borland, Biggar, and Stonehill, Abington
2nd	No 684	Charles Howatson of Glenbuck
3rd	No 692	James Murray, Low Ploughland, by Darvel
V	No 674	Cadzow Brothers, Borland, Biggar, and Stonehill, Abington
H	No 685	Charles Howatson of Glenbuck
C	No 683	Charles Howatson of Glenbuck

CHEVIOT

PRESIDENT'S CHAMPION MEDAL for best Pen of Cheviot Sheep

No 712 John Elliot, Hindhope, Jedburgh

CLASS 80 TUP, above one Shear—Premiums, £12, £8, £4, and £2

1st	No 693	John Elliot, Hindhope, Jedburgh
2nd	No 708	John Robson, Newton, Bellingham
3rd	No 698	John A. Johnstone, Archbank, Moffat
4th	No 694	John Elliot, Hindhope, Jedburgh
V	No 709	John Robson, Newton, Bellingham
H	No 710	J. R. C. Smith, Mowbrugh, Yetholm
C	No 699	John A. Johnstone, Archbank, Moffat

CLASS 81. SHEARLING TUP.—Premiums, £12, £8, £4, and £2.

- 1st. No. 712. John Elliot, Hindhope, Jedburgh.
- 2nd. No. 711. John Elliot, Hindhope, Jedburgh.
- 3rd. No. 726. John Robson, Newton, Bellingham.
- 4th. No. 713. John Elliot, Hindhope, Jedburgh.
- V. No. 714. John Elliot, Hindhope, Jedburgh.
- H. No. 716. John A. Johnstone, Archbank, Moffat.
- C. No. 715. John A. Johnstone, Archbank, Moffat.

CLASS 82. EWE, above one Shear, with her Lamb at foot.—
Premiums, £10, £5, and £2.

- 1st. No. 732. John Elliot, Hindhope, Jedburgh.
- 2nd. No. 733. John Elliot, Hindhope, Jedburgh.
- 3rd. No. 743. John Robson, Newton, Bellingham.
- V. No. 739. Jacob Robson, Byrness, Otterburn, Northumberland.
- H. No. 736. Matt. S. M'Kerrow, Boreland of Southwick, Dumfries.
- C. No. 737. The Earl of Minto, Minto, Hawick.

CLASS 83. SHEARLING EWE or GIMMER.—Premiums, £10, £5, and £2.

- 1st. No. 760. John Robson, Newton, Bellingham.
- 2nd. No. 761. John Robson, Newton, Bellingham.
- 3rd. No. 745. John Elliot, Hindhope, Jedburgh.
- V. No. 744. John Elliot, Hindhope, Jedburgh.
- H. No. 762. John Robson, Newton, Bellingham.
- C. No. 751. Matt. S. M'Kerrow, Boreland of Southwick, Dumfries.

BORDER LEICESTER.

PRESIDENT'S CHAMPION MEDAL for best Pen of Border Leicesters.

- No. 854. David Hume, Barrelwell, Brechin.

Tweeddale Gold Medal, value £20, for best Border Leicester Tup.

- No. 786. Thomas Clark, Oldhamstocks Mains, Cockburnspath.

CLASS 84. TUP, above one Shear.—Premiums, £12, £8, £4, and £2.

- 1st. No. 776. T. M'Intosh, Balquharn, Brechin.
- 2nd. No. 777. J. E. Nicholson, Manor House, Lanchester, Durham (BL 8).
- 3rd. No. 780. Matthew Templeton, Sandyknowe, Kelso.
- 4th. No. 778. George Pople, Newhouse, Perth, "Governor-General" (120).
- V. No. 775. David Hume, Barrelwell, Brechin, "John Peel" (150 Y 4).
- H. No. 767. The Right Hon. A. J. Balfour, M.P., Whittinghame, Prestonkirk.
- C. No. 779. Robert Taylor, Pitlilie Farm, Carnoustie, "Pitlilie Earl."

CLASS 85. SHEARLING TUP.—Premiums, £12, £8, £4, and £2.

- 1st. No. 786. Thomas Clark, Oldhamstocks Mains, Cockburnspath.
- 2nd. No. 782. The Right Hon. A. J. Balfour, M.P., Whittinghame, Prestonkirk.
- 3rd. No. 803. J. E. Nicholson, Manor House, Lanchester, Durham (BL 104).
- 4th. No. 820. Robert Wallace, Auchenbrain, Mauchline.
- V. No. 797. David Hume, Barrelwell, Brechin.
- H. No. 799. T. M'Intosh, Balquharn, Brechin.
- C. No. 787. Thomas Clark, Oldhamstocks Mains, Cockburnspath.

CLASS 86. EWE, above one Shear.—Premiums, £10, £5, and £2.

- 1st. No. 825. The Right Hon. A. J. Balfour, M.P., Whittinghame, Prestonkirk.
- 2nd. No. 826. The Right Hon. A. J. Balfour, M.P., Whittinghame, Prestonkirk.
- 3rd. No. 828. The Duke of Buccleuch and Queensberry, K.T., Dalkeith Park, Dalkeith.
- V. No. 833. John M. Twentyman, Hawkrigg House, Wigton, Cumberland.
- H. No. 834. John M. Twentyman, Hawkrigg House, Wigton, Cumberland.
- C. No. 832. J. & J. R. C. Smith, Galalaw, Kelso.

CLASS 87. SHEARLING EWE or GIMMER.—Premiums, £10, £5, and £2.

- 1st. No. 854. David Hume, Barrelwell, Brechin.
 2nd. No. 864. J. & J. R. C. Smith, Galalaw, Kelso.
 3rd. No. 837. The Right Hon. A. J. Balfour, M.P., Whittinghame, Prestonkirk.
 V. No. 844. Thomas Clark, Oldhamstocks Mains, Cockburnspath.
 H. No. 858. J. E. Nicholson, Manor House, Lanchester (BL 104).
 C. No. 836. The Right Hon. A. J. Balfour, M.P., Whittinghame, Prestonkirk.
 C. No. 851. William Ford, Fentonbarns, Drem.

HALF-BRED.

PRESIDENT'S CHAMPION MEDAL for best Pen of Half-Breds.

- No. 900. L. Morley Crossman, Goswick House, Beal, R.S.O., Northumberland.

*Best Half-Bred Tup in Classes 88 and 89—£5, given by Breeders,
 per Mr John Bertram.*

- No. 874. William Elliot, Raecleugh Head, Dunse, "Baden-Powell."

CLASS 88. TUP, above one Shear.—Premiums, £12, £8, £4, and £2.

- 1st. No. 874. William Elliot, Raecleugh Head, Dunse, "Baden-Powell."
 2nd. No. 872. L. Morley Crossman, Goswick House, Beal, R.S.O., Northumberland.
 3rd. No. 871. Alexander Crosbie, Blegbie, Upper Keith, East Lothian.
 4th. No. 873. Alexander Davidson, Colmslie, Galashiels.

CLASS 89. SHEARLING TUP.—Premiums, £12, £8, £4, and £2.

- 1st. No. 884. Andrew T. Elliot, Newhall, Galashiels.
 2nd. No. 887. James A. W. Mein, Hunthill, Jedburgh.
 3rd. No. 880. Robert Dickinson, Longcroft, Lauder.
 4th. No. 886. James A. W. Mein, Hunthill, Jedburgh.
 H. No. 881. Robert Dickinson, Longcroft, Lauder.

*Best Half-Bred Ewe or Gimmer in Classes 90 and 91—£5, given by Breeders,
 per Mr John Bertram.*

- No. 900. L. Morley Crossman, Goswick House, Beal, R.S.O., Northumberland.

CLASS 90. EWE, above one Shear.—Premiums, £10, £5, and £2.

- 1st. No. 890. Robert Dickinson, Longcroft, Lauder.
 2nd. No. 895. James A. W. Mein, Hunthill, Jedburgh.
 3rd. No. 889. Alexander Crosbie, Blegbie, Upper Keith, East Lothian.
 H. No. 888. John Bertram, Addinston, Lauder.

CLASS 91. SHEARLING EWE or GIMMER.—Premiums, £10, £5, and £2.

- 1st. No. 900. L. Morley Crossman, Goswick House, Beal, R.S.O., Northumberland.
 2nd. No. 905. James A. W. Mein, Hunthill, Jedburgh.
 3rd. No. 897. John Bertram, Addinston, Lauder.
 H. No. 901. L. Morley Crossman, Goswick House, Beal, R.S.O., Northumberland.

SHROPSHIRE.

PRESIDENT'S CHAMPION MEDAL for best Pen of Shropshires

- No. 908. Richard P. Cooper, Ashlyns Hall, Berkhamsted, Herts, "Ashlyns' Knight."

CLASS 92. TUP, above one Shear.—Premiums, £6, £4, and £2.

- 1st. No. 908. Richard P. Cooper, Ashlyns Hall, Berkhamsted, Herts, "Ashlyns' Knight."
 2nd. No. 907. David Buttar, Corston, Coupar-Angus.
 3rd. No. 910. William Mortimer, Old Keig, Whitehouse.
 V. No. 909. Sir Robert D. Moncreiffe of Moncreiffe, Bart., Bridge of Earn, "Moncreiffe Matchless" (10,427).

CLASS 93. SHEARLING TUP.—Premiums, £6, £4, and £2.

- 1st. No. 911. David Buttar, Corston, Coupar-Angus.
- 2nd. No. 916. Richard P. Cooper, Ashlyns Hall, Berkhamsted, Herts.
- 3rd. No. 912. David Buttar, Corston, Coupar-Angus.
- V. No. 913. David Buttar, Corston, Coupar-Angus.
- H. No. 914. David Buttar, Corston, Coupar-Angus.
- C. No. 915. David Buttar, Corston, Coupar-Angus.

CLASS 94. EWE, above one Shear.—Premiums, £5, £3, and £2.

- 1st. No. 924. Richard P. Cooper, Ashlyns Hall, Berkhamsted, Herts.
- 2nd. No. 925. Richard P. Cooper, Ashlyns Hall, Berkhamsted, Herts.
- 3rd. No. 923. David Buttar, Corston, Coupar-Angus.
- V. No. 922. David Buttar, Corston, Coupar-Angus.

CLASS 95. SHEARLING EWE or GIMMER.—Premiums, £5, £3, and £2.

- 1st. No. 926. David Buttar, Corston, Coupar-Angus.
- 2nd. No. 928. Richard P. Cooper, Ashlyns Hall, Berkhamsted, Herts.
- 3rd. No. 932. The Earl of Strathmore, Glamis Castle, Glamis.
- V. No. 927. David Buttar, Corston, Coupar-Angus.
- H. No. 929. Richard P. Cooper, Ashlyns Hall, Berkhamsted, Herts.
- C. No. 931. The Earl of Strathmore, Glamis Castle, Glamis.

OXFORD DOWNS.

PRESIDENT'S CHAMPION MEDAL for best Pen of Oxford Downs.

- No. 939. J. & S. Treadwell, Winehendon, Aylesbury.

CLASS 96. SHEARLING TUP.—Premiums, £6, £4, and £2.

- 1st. No. 939. J. & S. Treadwell, Winehendon, Aylesbury.
- 2nd. No. 940. J. & S. Treadwell, Winehendon, Aylesbury.
- 3rd. No. 938. J. & S. Treadwell, Winehendon, Aylesbury.
- V. No. 934. The Right Hon. A. J. Balfour, M.P., Whittinghame, Prestonkirk.
- H. No. 936. Walter Elliot, Hollybush, Galashiels.

CLASS 97. SHEARLING EWE or GIMMER.—Premiums, £5, £3, and £2.

- 1st. No. 943. The Right Hon. A. J. Balfour, M.P., Whittinghame, Prestonkirk.
- 2nd. No. 942. The Right Hon. A. J. Balfour, M.P., Whittinghame, Prestonkirk.
- 3rd. No. 945. Walter Elliot, Hollybush, Galashiels.
- V. No. 944. Walter Elliot, Hollybush, Galashiels.

SUFFOLK.

PRESIDENT'S CHAMPION MEDAL for best Pen of Suffolk Sheep.

- No. 948. Earl of Ellesmere, Stetchworth Park, Newmarket, Cambs.

CLASS 98. SHEARLING TUP.—Premiums, £6, £4, and £2.

- 1st. No. 948. Earl of Ellesmere, Stetchworth Park, Newmarket, Cambs.
- 2nd. No. 947. Earl of Ellesmere, Stetchworth Park, Newmarket, Cambs.
- 3rd. No. 946. Major E. W. Baird, Exning House, Newmarket, "Gunner of Stetchworth" (5461).

CLASS 99. SHEARLING EWE or GIMMER.—Premiums, £5, £3, and £2.

- 1st. No. 951. Earl of Ellesmere, Stetchworth Park, Newmarket, Cambs.
- 2nd. No. 952. Earl of Ellesmere, Stetchworth Park, Newmarket, Cambs.
- 3rd. No. 950. Major E. W. Baird, Exning House, Newmarket.

CLASS 100. THREE EWE LAMBS.—Premiums, £5, £3, and £2,
given by the Suffolk Sheep Society.

- 1st. No. 954. Earl of Ellesmere, Stetchworth Park, Newmarket, Cambs.
- 2nd. No. 953. Major E. W. Baird, Exning House, Newmarket.

EXTRA SECTIONS

Best Pen of Lambs in Class 104 got by a Suffolk Tup, and out of Cheviot or Blackfaced Ewes—Prize of £5, given by the Suffolk Sheep Society

No 967 John Anslie, Temple Hall, Ormiston, East Lothian (Suffolk Tup out of Cheviot Ewes)

Best Pen of Lambs in Class 104 got by a Suffolk Tup, and out of Border Leicester, Half bred, or Three parts bred Ewes—Prize of £5 given by the Suffolk Sheep Society

No 975 Colonel John Murray, Polmarc Castle, Stirling (Suffolk Tup out of Half bred Ewes)

Best Pens of Cross bred Lambs in Class 104 got by an Oxford Down Tup—Prizes of £6, £4, and £3, given by Oxford Down Sheep Breeders Association

1st No 976 R D Thom, Pitlochrie, Gaterside (Oxford Tup out of Half bred Ewes)

2nd No 971 J S Combe, Blair Mains, Culross (Oxford Down Tup out of Half bred Ewes)

Best Pens of Cross bred Lambs in Class 104 got by a Shropshire Tup—Prizes of £5, £3 and £2, given by Breeders of Shropshire Sheep, per Mr David Buttur

1st No 977 George Willsher, Pitpointie Dundee (Shropshire Tup out of Border Leicester Ewes)

2nd No 969 Alex Anderson, Berryhill, Dundee (Shropshire Tup out of Dorset Horn Ewes)

3rd No 968 Alex Anderson, Berryhill, Dundee (Shropshire Tup out of Dorset Horn Ewes)

CLASS 101 Three BLACKFACED WETHERS, one Shear —Premiums, £5 and £3

1st No 955 Sir John Gilmour of Lundin and Montrave Bart, Leven, Fife

2nd No 957 Alexander Guild, W S, Aberlady Mains, Aberlady

CLASS 102 Three CHEVIOT WETHERS, one Shear —Premiums, £5 and £3

1st No 960 H W Hope of Luffness, Luffness Mains, Aberlady

2nd No 959 Alexander Guild W S, Aberlady Mains, Aberlady

CLASS 103 Three SHEARLING WETHERS, any Cross, out of Blackfaced Ewes. —Premiums, £5 and £3

1st No 962 F W Christie, Dursie Mains, Cupar Fife (by Wensleydale Tup)

2nd No 966 John Mitchell, Fliskmillan, Newburgh, Fife (by Leicester Tup)

H No 965 John Mitchell, Fliskmillan, Newburgh, Fife (by Leicester Tup)

C No 963 J S Combe, Blair Mains, Culross (by Leicester Tup)

CLASS 104 Five FAT LAMBS, any Breed or Cross, dropped after 1st January of the year of the Show —Premiums, £5 and £3

1st No 977 George Willsher, Pitpointie, Dundee (Shropshire Tup out of Border Leicester Ewes)

2nd No 976 R D Thom, Pitlochrie, Gaterside (Oxford Tup out of Half bred Ewes)

V No 974 Earl of Minto, Minto, Hawick (Suffolk Tup out of Cheviot Ewes)

H No 969 Alex Anderson, Berryhill, Dundee (Shropshire Tup out of Dorset Horn Ewes)

EXTRA STOCK.

The following was Highly Commended, and a Medium Silver Medal awarded

H No 978 W Marshall, Glenwhommie, Dunblane (three Cross Hogs, by Leicester Tup out of Blackfaced Ewes)

WOOL

BLACKFACE WOOL.

CLASS 105. BLACKFACE WETHER WOOL, five Fleeces.—Premiums, £3, £2, and £1, given by Sir Robert Menzies, Bart.

- 1st. No. 983. Campbell Willison, Glenlochay, Killin.
- 2nd. No. 979. George Bullough, Run, by Oban.
- 3rd. No. 981. James Reid, Penchrise, Stobs, Hawick.
- V. No. 992. Campbell Willison, Acharn, Killin.

CLASS 106. BLACKFACE EWE WOOL, five Fleeces.—Premiums, £3, £2, and £1, given by Sir Robert Menzies, Bart.

- 1st. No. 989. James Reid, Penchrise, Stobs, Hawick.
- 2nd. No. 987. James Milligan, Hayfield, Thornhill, Dumfriesshire.
- 3rd. No. 992. Campbell Willison, Glenlochay, Killin.
- V. No. 988. James Milligan, Hayfield, Thornhill, Dumfriesshire.
- H. No. 991. Campbell Willison, Acharn, Killin.
- C. No. 986. Lord Malcolm of Poltalloch, Lochgilphead.

CLASS 107. BLACKFACE EWE or WETHER HOGG WOOL, five Fleeces.—Premiums, £3, £2, and £1, given by Sir Robert Menzies, Bart.

- 1st. No. 999. James Reid, Penchrise, Stobs, Hawick.
- 2nd. No. 994. R C Munro Ferguson of Novar, M P, Ewinton.
- 3rd. No. 997. James Milligan, Hayfield, Thornhill, Dumfriesshire.
- V. No. 995. James Milligan, Hayfield, Thornhill, Dumfriesshire.
- H. No. 1002. Campbell Willison, Glenlochay, Killin.
- C. No. 990. Lord Malcolm of Poltalloch, Lochgilphead.

SWINE

PRESIDENT'S CHAMPION MEDAL for best Pen of Swine

- No 1019. R & A Walker, East Craigs Farm, Corstorphine, Mid Lothian, "East Craigs' Beauty" (9634).

LARGE WHITE BREED.

CLASS 108. BOAR.—Premiums, £5 and £3.

- 1st. No. 1004. Sanders Spencer, Holywell Manor, St Ives, Hunts, "Holywell Royalty II."
- 2nd. No. 1003. John Lockhart, Colinton Mains, Colinton, "Walton Eclipse II"
- V. No. 1005. R. & A Walker, East Craigs Farm, Corstorphine, Mid Lothian, "East Craigs' General" (4671)

CLASS 109. SOW.—Premiums, £5 and £3.

- 1st. No. 1007. R. & A. Walker, East Craigs Farm, Corstorphine, Mid Lothian, "Lady Tichborne" (8062)
- 2nd. No. 1006. The Earl of Rosebery, K G, Dalmeny Park, Edinburgh, "Dalmeny Long Lass" (9448).

CLASS 110. Three PIGS, not above 8 months old.—Premiums, £4 and £2.

- 1st. No. 1010. Sanders Spencer, Holywell Manor, St Ives, Hunts.
- 2nd. No. 1011. A. Enever Todd, Stoneybank, Musselburgh.
- V. No. 1009. Sanders Spencer, Holywell Manor, St Ives, Hunts.
- H. No. 1012. A. Enever Todd, Stoneybank, Musselburgh.

WHITE BREED OTHER THAN LARGE.

CLASS 111. BOAR.—Premiums, £5 and £3.

- 1st. No 1015. Sanders Spencer, Holywell Manor, St Ives, Hunts, "Holywell Rosador."
 2nd. No. 1016 R. & A. Walker, East Craigs Farm, Corstorphine, Mid-Lothian, "East Craigs' Prince" (5705).

CLASS 112. SOW.—Premiums, £5 and £3.

- 1st. No 1019. R. & A. Walker, East Craigs Farm, Corstorphine, Mid-Lothian, "East Craigs' Beauty" (9834).
 2nd. No 1019. Sanders Spencer, Holywell Manor, St Ives, Hunts, "Holywell Middlesboro' II."
 H. No. 1017 J. Jefferson, Peel Hall, Chester.

CLASS 113. Three PIGS, not above 8 months old.—Premiums, £4 and £2.

- 1st. No. 1020. J. Jefferson, Peel Hall, Chester.
 2nd. No. 1022. R. & A. Walker, East Craigs Farm, Corstorphine, Mid-Lothian.
 H. No. 1021. Sanders Spencer, Holywell Manor, St Ives, Hunts.

BERKSHIRE.

CLASS 114. BOAR --Premiums, £5 and £3.

- 1st No. 1023. J. Jefferson, Peel Hall, Chester, "Peel Royal" (7331).
 2nd. No. 1024 J. Jefferson, Peel Hall, Chester.

CLASS 115. SOW.—Premiums, £5 and £3.

- 1st. No 1027. J. Jefferson, Peel Hall, Chester, "Peel Agnes" (7333)
 2nd. No. 1026. J. Jefferson, Peel Hall, Chester, "Peel Jessie" (6698).
 V No 1025 William Dow, 18 Hawkhill, Dundee, "Dora."
 H No 1028. William M'Queen, Shrigarton, Kippen.

CLASS 116 Three PIGS, not above 8 months old. —Premiums, £4 and £2

- 1st No. 1029 J. Jefferson, Peel Hall, Chester.
 2nd No. 1030. J. Jefferson, Peel Hall, Chester

POULTRY

First Premium—*One Sovereign*. Second Premium—*Ten Shillings*. And where there are six or more entries, Third Premium—*Five Shillings*.

CHAMPION MEDALS.

1. *Best Cock, any variety.*

- No 2. A. K. Crichton, Glamis, N.B., (Dorking).

2. *Best Hen, any variety.*

- No. 8 J. T. Cathcart, Dunbog House, Newburgh, Fife (Dorking).

3. *Best Cockerel, any variety.*

- No 389 David M'Gibbon, Ard na Craig, Campbeltown (Spanish).

4. *Best Pullit, any variety.*

- No. 68. George M'Bain, Linkwood, Elgin (Dorking).

5. *Best Pen of Ducks.*

- No. 398. John Gillies, Edington Mills, Chrnside (Aylesbury).

6. *Best Pen of Geese.*

No. 440. Alexander Shanks, Cuthelton Farm, Denny (Toulouse).

7. *Best Pen of Turkeys.*

No. 442. Robert Clark, Taybank, Errol (Bronze).

CLASS 1. DORKING, Coloured. Cock

- | | | |
|------|--------|---|
| 1st. | No. 2. | A. K. Crichton, Glamis, N.B. |
| 2nd. | No. 4. | John Gillies, Edington Mills, Chirnside. |
| 3rd. | No. 1. | J. T. Cathcart, Dunbog House, Newburgh, Fife. |
| V. | No. 6. | W. Marshall, Glenwhommie, Dunblane. |
| H. | No. 3. | Robert Fitton, Ribby Hall, Kirkham, Lancashire. |
| C. | No. 7. | Richardson Brothers, Muir, Bannockburn. |

CLASS 2. DORKING, Coloured. Hen.

- | | | |
|------|---------|--|
| 1st. | No. 8. | J. T. Cathcart, Dunbog House, Newburgh, Fife. |
| 2nd. | No. 11. | Countess of Home, The Hirsell, Coldstream. |
| 3rd. | No. 10. | John Gillies, Edington Mills, Chirnside. |
| V. | No. 15. | John Meikle, Auchencruive Estates Office, Mount Hamilton, Ayr. |
| H. | No. 9. | Robert Fitton, Ribby Hall, Kirkham, Lancashire. |
| C. | No. 14. | W. Marshall, Glenwhommie, Dunblane. |

CLASS 3. DORKING, Coloured. Cockerel.

- | | | |
|------|---------|---|
| 1st. | No. 19. | Robert Fitton, Ribby Hall, Kirkham, Lancashire. |
| 2nd. | No. 21. | Countess of Home, The Hirsell, Coldstream. |
| 3rd. | No. 17. | J. T. Cathcart, Dunbog House, Newburgh, Fife. |
| V. | No. 20. | John Gillies, Edington Mills, Chirnside. |

CLASS 4. DORKING, Coloured. Pullet.

- | | | |
|------|---------|---|
| 1st. | No. 25. | Robert Fitton, Ribby Hall, Kirkham, Lancashire. |
| 2nd. | No. 27. | W. Marshall, Glenwhommie, Dunblane. |
| V. | No. 23. | J. T. Cathcart, Dunbog House, Newburgh, Fife. |
| H. | No. 26. | Countess of Home, The Hirsell, Coldstream. |

CLASS 5. DORKING, Silver Grey. Cock.

- | | | |
|------|---------|---|
| 1st. | No. 32. | Robert Fitton, Ribby Hall, Kirkham, Lancashire. |
| 2nd. | No. 31. | Robert Fitton, Ribby Hall, Kirkham, Lancashire. |
| 3rd. | No. 34. | John Laing, Burnside, Auchtermuchty. |
| V. | No. 28. | J. T. Cathcart, Dunbog House, Newburgh, Fife. |
| H. | No. 36. | David M'Gibbon, Ard-na-Craig, Campbeltown. |
| C. | No. 37. | John Mechie, jun., Auchtermuchty. |

CLASS 6. DORKING, Silver Grey. Hen.

- | | | |
|------|---------|---|
| 1st. | No. 45. | Robert Fitton, Ribby Hall, Kirkham, Lancashire. |
| 2nd. | No. 55. | John Tweedie, South Arthurlie, Barrhead. |
| 3rd. | No. 52. | David M'Gibbon, Ard-na-Craig, Campbeltown. |
| V. | No. 48. | John Laing, Burnside, Auchtermuchty. |
| H. | No. 51. | George M'Bain, Linkwood, Elgin. |
| C. | No. 50. | George M'Bain, Linkwood, Elgin. |

CLASS 7. DORKING, Silver Grey. Cockerel.

- | | | |
|------|---------|---|
| 1st. | No. 56. | Robert Fitton, Ribby Hall, Kirkham, Lancashire. |
| 2nd. | No. 60. | George M'Bain, Linkwood, Elgin. |
| 3rd. | No. 57. | Robert Fitton, Ribby Hall, Kirkham, Lancashire. |
| V. | No. 62. | Thomas Rae, Craighlaw, Kirkcowan. |
| H. | No. 59. | John Laing, Burnside, Auchtermuchty. |
| C. | No. 58. | John Howie, jun., Knowehead, Craigie, Kilmarnock. |

CLASS 8. DORKING, Silver Grey. Pullet.

- 1st. No. 68. George M'Bain, Linkwood, Elgin.
 2nd. No. 64. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
 3rd. No. 67. John Laing, Burnside, Auchtermuchty.
 V. No. 69. John Meikle, Auchencruive Estates Office, Mount Hamilton, Ayr.
 H. No. 85. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
 C. No. 66. John Howie, jun., Knowehead, Craigie, Kilmarnock.

CLASS 9. COCHIN-CHINA. Cock.

- 1st. No. 77. T. Gill, Summerbridge, Leeds.
 2nd. No. 76. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
 V. No. 75. John Ferguson, 7 North Inglis Street, Dunfermline.
 H. No. 78. Mrs Leslie, 23 Elmfield Avenue, Aberdeen.
 C. No. 74. George Archibald, Blebo Craigs, Cupar-Fife.

CLASS 10. COCHIN-CHINA. Hen.

- 1st. No. 79. John Ferguson, 7 North Inglis Street, Dunfermline.

CLASS 11. BRAHMAPOOTRA. Cock.

- 1st. No. 81. John Gillies, Edington Mills, Chirnside.
 2nd. No. 80. George Archibald, Blebo Craigs, Cupar-Fife.
 V. No. 82. James Logan, East Linton, Prestonkirk.

CLASS 12. BRAHMAPOOTRA. Hen.

- 1st. No. 84. John Gillies, Edington Mills, Chirnside.
 2nd. No. 85. Mrs Leslie, 28 Elmfield Avenue, Aberdeen.

CLASS 13. BRAHMA or COCHIN. Cockerel.

- 1st. No. 86. John Gillies, Edington Mills, Chirnside (Brahma).
 2nd. No. 88. John Roberts, Balhaldie House, Dunblane (Brahma).
 V. No. 87. Mrs Leslie, 28 Elmfield Avenue, Aberdeen (Cochin).

CLASS 14. BRAHMA or COCHIN. Pullet.

- 1st. No. 90. John Roberts, Balhaldie House, Dunblane (Brahma).
 2nd. No. 91. R. Waddell, Barnsdale Poultry Farm, St Ninians (Brahma).
 V. No. 89. John Gillies, Edington Mills, Chirnside (Brahma).

CLASS 15. SCOTCH GREY. Cock.

- 1st. No. 93. David M'Gibbon, Ard-na-Craig, Campbeltown.
 2nd. No. 98. A. Mitchell, The Bush, Rothesay.
 3rd. No. 95. David M'Gibbon, Ard-na-Craig, Campbeltown.
 V. No. 94. David M'Gibbon, Ard-na-Craig, Campbeltown.
 H. No. 96. David M'Gibbon, Ard-na-Craig, Campbeltown.
 C. No. 92. Alexander Hamilton, Tile Works, Braidwood Station.

CLASS 16. SCOTCH GREY. Hen.

- 1st. No. 105. David M'Gibbon, Ard-na-Craig, Campbeltown.
 2nd. No. 106. David M'Gibbon, Ard-na-Craig, Campbeltown.
 3rd. No. 108. David Hastings, Glaister Cottage, Darvel, Ayrshire.
 V. No. 102. Alexander Brown, Mason's Arms, Neilston.
 H. No. 107. David M'Gibbon, Ard-na-Craig, Campbeltown.
 C. No. 108. Peter Mitchell, Bridgend Farm, Airth Road, Stirling.

CLASS 17. SCOTCH GREY. Cockerel.

- 1st. No. 113. John Robertson, Schawpark, Alloa.
 2nd. No. 111. David Hastings, Glaister Cottage, Darvel, Ayrshire.
 V. No. 110. James Gegg, Dalziel Gardens, Motherwell.
 H. No. 112. David M'Gibbon, Ard-na-Craig, Campbeltown.

CLASS 18. SCOTCH GREY. Pullet.

- 1st. No. 117. John Robertson, Schawpark, Alloa.
 2nd. No. 114. James Gegg, Dalziel Gardens, Motherwell.
 V. No. 115. David Hastings, Glaister Cottage, Darvel, Ayrshire.
 H. No. 116. David M'Gibbon, Ard-na-Craig, Campbeltown.

CLASS 19. HAMBURG—Black. Cock.

- 1st. No. 122. William Kerr, Stirling.
 2nd. No. 119. W. & J. Forsyth, Clackmannan.
 3rd. No. 124. William Steel, 74 St Andrew's Terrace, Kilmarnock.
 V. No. 121. David Govan, 346 Great Eastern Road, Parkhead, Glasgow.
 H. No. 120. Lewis Gavin, The Schoolhouse, Drumwhindle, Ellon.
 C. No. 125. William Steel, 74 St Andrew's Terrace, Kilmarnock.

CLASS 20. HAMBURG—Black. Hen.

- 1st. No. 126. W. & J. Forsyth, Clackmannan.
 2nd. No. 127. W. & J. Forsyth, Clackmannan.
 3rd. No. 129. David Govan, 346 Great Eastern Road, Parkhead, Glasgow.
 V. No. 130. William Kerr, Stirling.
 H. No. 128. John Gillies, Edington Mills, Chirnside.
 C. No. 131. William Steel, 74 St Andrew's Terrace, Kilmarnock.

CLASS 21. HAMBURG—Any other Variety. Cock.

- 1st. No. 137. William Kerr, Stirling (Gold pencilled).
 2nd. No. 132. J. M. Campbell, Bonny Kelly, New Pittsigo (Silver spangled).
 3rd. No. 134. David Govan, 346 Great Eastern Road, Parkhead, Glasgow (Silver spangled).
 V. No. 133. David Govan, 346 Great Eastern Road, Parkhead, Glasgow (Silver spangled).
 H. No. 135. William Kerr, Stirling (Silver spangled).
 C. No. 138. Malcolm M'Kinnon, East King Street, Paisley (Gold).

CLASS 22. HAMBURG—Any other Variety. Hen.

- 1st. No. 141. David Govan, 346 Great Eastern Road, Parkhead, Glasgow (Silver spangled).
 2nd. No. 145. Malcolm M'Kinnon, East King Street, Paisley (Gold).
 3rd. No. 144. William Kerr, Stirling (Gold pencilled).
 V. No. 142. William Kerr, Stirling (Silver spangled).
 H. No. 143. William Kerr, Stirling (Gold spangled).
 C. No. 140. David Govan, 346 Great Eastern Road, Parkhead, Glasgow (Silver spangled).

CLASS 23. HAMBURG—Any Variety. Cockerel.

- 1st. No. 146. George Gibb, Maybank, East Calder (Black Hamburg).
 2nd. No. 147. David Govan, 346 Great Eastern Road, Parkhead, Glasgow (Silver spangled).
 V. No. 148. William Kerr, Stirling (Silver spangled).

CLASS 24. HAMBURG—Any Variety. Pullet.

- 1st. No. 149. David Govan, 346 Great Eastern Road, Parkhead, Glasgow.
 2nd. No. 150. William Kerr, Stirling (Silver spangled).

CLASS 25. PLYMOUTH ROCK. Cock.

- 1st. No. 158. R. Waddell, Barnsdale Poultry Farm, St Ninians.
 2nd. No. 151. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
 3rd. No. 155. Thomas Stevenson, Sauchenbush, Kirkcaldy.
 V. No. 154. Wm. Slater, Bigland House, Silverdale, Carnforth.
 H. No. 152. Duncan M'Millan, Old Smithy, Drymen.
 C. No. 156. John B. Tulloch, The Dales, Inverkeithing.

CLASS 26. PLYMOUTH ROCK. Hen.

- 1st. No. 162. R. Waddell, Barnsdale Poultry Farm, St Ninians.
 2nd. No. 161. Wm. Slater, Bigland House, Silverdale, Carnforth.
 V. No. 160. Richardson Brothers, Muir, Bannockburn.
 H. No. 159. William Kerr, Stirling.

CLASS 27. PLYMOUTH ROCK. Cockerel.

- 1st. No. 163. T. H. Bargh, Rigmaden Farm, Kirkby Lonsdale.
 2nd. No. 164. Samuel Donkin, The Pheasantry, Studley, Warwickshire.
 3rd. No. 168. Wm. Slater, Bigland House, Silverdale, Carnforth.
 V. No. 165. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
 H. No. 167. James Glen, 5 West Breast, Greenock
 C. No. 169. R. Waddell, Barnsdale Poultry Farm, St Nimians.

CLASS 28. PLYMOUTH ROCK. Pullet.

- 1st. No 170 Samuel Donkin, The Pheasantry, Studley, Warwickshire.
 2nd. No. 172 James Glen, 5 West Breast, Greenock.
 V. No. 171. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
 H. No 174. William Slater, Bigland House, Silverdale, Carnforth

CLASS 29. MINORCA. Cock.

- 1st. No. 176. John Gillies, Edington Mills, Chirnside.
 2nd No. 180. William J. H. Ritchie, Hawthorn Villa, Denny.
 3rd. No 175. Mrs P. Elliot, Bonkyl Lodge, Duns
 V. No 177. John Gillies, Edington Mills, Chirnside
 H No. 178. Countess of Home, The Hirsell, Coldstream.
 C. No 183. Robert Waddell, Dumpace, Denny.

CLASS 30 MINORCA. Hen.

- 1st. No. 186. John Gillies, Edington Mills, Chirnside
 2nd. No. 188. Countess of Home, The Hirsell, Coldstream.
 3rd. No. 190. George Milne, Whitburn
 V. No 184 W. S. Craig, 21 Dundas Street, Bonnyrigg
 H. No 185. W. S. Craig, 21 Dundas Street, Bonnyrigg
 C. No. 189. John B. Malcolm, Auchterarder Castle, Auchterarder

CLASS 31. MINORCA Cockerel.

- 1st. No. 192. Countess of Home, The Hirsell, Coldstream.
 2nd. No. 194. R. Waddell, Barnsdale, Poultry Farm, St Nimians

CLASS 32. MINORCA. Pullet.

- 1st. No 197. Countess of Home, The Hirsell, Coldstream.
 2nd No 195 John W. Crossman, The Shrubberies, Galphay, Ripon, Yorkshire.
 3rd No 196. Mrs P. Elliot, Bonkyl Lodge, Duns.
 V. No. 200. R. Waddell, Barnsdale Poultry Farm, St Nimians

CLASS 33. LEGHORN—White. Cock.

- 1st. No. 204. John King, Rodenbain, Hollybush, Ayr.
 2nd. No 205. David Martin, 14 Castlefield, Cupar Fife
 3rd No 206. Mon Robertson, Cairneyhill, Dunfermline
 V. No 208. R. Waddell, Barnsdale Poultry Farm, St Nimians.
 H No 202. Glen & Gourlay, Nitshill, Glasgow
 C. No. 203. John King, Rodenbain, Hollybush, Ayr

CLASS 34. LEGHORN—White. Hen.

- 1st No 218. John Skinner, 34 St Clair Place, Kirkcaldy
 2nd No 214 David Martin, 14 Castlefield, Cupar Fife
 3rd No 216 Mon Robertson, Cairneyhill, Dunfermline.
 V. No 215. Mon Robertson, Cairneyhill, Dunfermline
 H No. 217. Mrs George Shiell, The Lodge, Drummuir, Keith
 C. No. 211 Glen & Gourlay, Nitshill, Glasgow.

CLASS 35 LEGHORN—Any other Variety. Cock.

- 1st. No 219 John King, Rodenbain, Hollybush, Ayr (Brown).
 2nd. No 223. Walter Stark, Redyke, Biggar (Brown)
 3rd. No 222. The Earl of Rosebery, K G, Dalmeny Park, Edinburgh (Brown)
 V. No. 221. Robert Pullar, 19 Peddie Street, Dundee (Brown)
 H. No. 226. John B. Tulloch, The Dales, Inverkeithing (Buff).
 C. No. 220. David Mealls, jun., Dumpace, Denny (Brown).

CLASS 36. LEGHORN—Any other Variety. Hen.

- 1st. No. 231. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh (Brown).
 2nd. No. 232. William Slater, Bigland House, Silverdale, Carnforth (Pile).
 3rd. No. 229. George M'Alpine, Townhead, Meikle Earnock, Hamilton (Brown).
 V. No. 227. Mrs William Hart, Croft Terrace, Selkirk (Brown).
 H. No. 234. John B. Tulloch, The Dales, Inverkeithing (Buff).
 C. No. 230. David Mealls, jun., Dunipace, Denny (Brown).

CLASS 37. LEGHORN—Any Variety. Cockerel.

- 1st. No. 236. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh (Brown).
 2nd. No. 240. William Watson, Craigton Farm, Clackmannan.
 3rd. No. 238. R. Waddell, Barnsdale Poultry Farm, St Ninians (White).
 V. No. 235. Moir Robertson, Cairneyhill, Dunfermline (White).
 H. No. 239. William Watson, Craigton Farm, Clackmannan.
 C. No. 237. R. Waddell, Barnsdale Poultry Farm, St Ninians (White).

CLASS 38. LEGHORN—Any Variety. Pullet.

- 1st. No. 241. Richardson Brothers, Muir, Bannockburn (White).
 2nd. No. 244. R. Waddell, Barnsdale Poultry Farm, St Ninians (White).
 3rd. No. 243. Wm. Slater, Bigland House, Silverdale, Carnforth (Pile).
 V. No. 242. The Earl of Rosebery, K.G., Dalmeny Park, Edinburgh.
 H. No. 245. William Watson, Craigton Farm, Clackmannan.
 C. No. 246. William Watson, Craigton Farm, Clackmannan.

CLASS 39. LANGSHAN. Cock.

- 1st. No. 249. James Mitchell, New Road, Bannockburn.
 2nd. No. 250. Thomas Stevenson, Sauchenbush, Kirkcaldy.
 V. No. 251. Andrew Wyles, High Street, Strathmiglo.
 H. No. 248. A. Mitchell, The Bush, Rothesay.
 C. No. 247. John B. Malcolm, Auchterarder Castle, Auchterarder.

CLASS 40. LANGSHAN. Hen.

- 1st. No. 252. J. T. Cathcart, Dunbog House, Newburgh, Fife.
 2nd. No. 254. James Mitchell, New Road, Bannockburn.
 V. No. 256. A. Robertson, Barholm, Kilbarchan.
 H. No. 253. John B. Malcolm, Auchterarder Castle, Auchterarder.
 C. No. 255. James Mitchell, New Road, Bannockburn.

CLASS 41. ORPINGTON. Cock.

- 1st. No. 257. Mrs Colin E. Chisholm, Grange of Elcho, Perth (Buff).
 2nd. No. 261. Thomas Lockwood, Pateley Bridge, Yorkshire.
 3rd. No. 258. Mrs Colin E. Chisholm, Grange of Elcho, Perth (Black).
 V. No. 259. John Gillies, Edington Mills, Chirnside.
 H. No. 263. James Paterson, Kidshiellaugh, Duns.
 C. No. 262. A. Mitchell, The Bush, Rothesay.

CLASS 42. ORPINGTON. Hen.

- 1st. No. 266. John Gillies, Edington Mills, Chirnside.
 2nd. No. 269. R. Mackay, Rottearns House, Greenloaning, Braco, Perthshire.
 V. No. 268. Thomas Lockwood, Pateley Bridge, Yorkshire.
 H. No. 267. Countess of Home, The Hirsell, Coldstream.
 C. No. 270. James Paterson, Kidshiellaugh, Duns.

CLASS 43. LANGSHAN or ORPINGTON. Cockerel.

- 1st. No. 271. Thomas Lockwood, Pateley Bridge, Yorkshire (Orpington).
 2nd. No. 273. William Slater, Bigland House, Silverdale, Carnforth (Buff).
 V. No. 274. John B. Tulloch, The Dales, Inverkeithing (Orpington).
 H. No. 272. W. Marshall, Glenwhommie, Dunblane (Orpington).

CLASS 44. LANGSHAN or ORPINGTON. Pullet.

- 1st. No. 278. Thomas Lockwood, Pateley Bridge, Yorkshire (Orpington).
 2nd. No. 280. William Slater, Bigland House, Silverdale, Carnforth (Buff).
 3rd. No. 276. Robert Fitton, Ribby Hall, Kirkham, Lancashire (Orpington).

- V. No. 231. John B. Tulloch, The Dales, Inverkeithing (Orpington).
 H. No. 233. R. Waddell, Barnsdale Poultry Farm, St Ninians (Orpington).
 C. No. 277. James Glen, 5 West Breast, Greenock (Orpington).

CLASS 45. WYANDOTTE—Gold or Silver. Cock.

- 1st. No. 285. Robert Fitton, Ribby Hall, Kirkham, Lancashire (Gold).
 2nd. No. 289. Thomas Lockwood, Pateley Bridge, Yorkshire (Silver).
 3rd. No. 287. William Kerr, Stirling (Gold spangled).
 V. No. 284. James Ballantyne, 1 Elcho Street, Peebles (Silver).
 H. No. 290. Ernest H. Graham Stirling, Camp Cottage, Comrie (Golden).
 C. No. 288. William Kerr, Stirling (Gold spangled).

CLASS 46. WYANDOTTE—Gold or Silver. Hen.

- 1st. No. 292. Thomas Lockwood, Pateley Bridge, Yorkshire (Silver).
 2nd. No. 291. James Ballantyne, 1 Elcho Street, Peebles (Silver).

CLASS 47. WYANDOTTE—Any other Variety. Cock.

- 1st. No. 294. John Wharton, Honeycott, Hawes, Yorkshire (Partridge).
 2nd. No. 293. Thomas Lockwood, Pateley Bridge, Yorkshire (White).

CLASS 48. WYANDOTTE—Any other Variety. Hen.

- 1st. No. 298. John Wharton, Honeycott, Hawes, Yorkshire (Partridge).
 2nd. No. 297. Thomas Lockwood, Pateley Bridge, Yorkshire (White).
 V. No. 296. John Johnston, Slates, Nitshill, Glasgow (White).

CLASS 49. WYANDOTTE—Any Variety. Cockerel.

- 1st. No. 300. Thomas Lockwood, Pateley Bridge, Yorkshire (White).
 2nd. No. 299. Mrs Hunter, Anton's Hill, Coldstream (Silver).
 V. No. 301. W. & A. Thomson, Drumburn, New Abbey, Dumfries.

CLASS 50. WYANDOTTE—Any Variety. Pullet.

- 1st. No. 302. James Ballantyne, 1 Elcho Street, Peebles (Silver).
 2nd. No. 307. W. & A. Thomson, Drumburn, New Abbey, Dumfries.
 3rd. No. 305. Thomas Lockwood, Pateley Bridge, Yorkshire (Silver).
 V. No. 303. T. Gill, Summerbridge, Leeds.
 H. No. 306. John Love, West Port, Whitburn, Linlithgowshire (Silver).
 C. No. 304. Mrs Hunter, Anton's Hill, Coldstream (Silver).

CLASS 51. GAME—Old English. Cock.

- 1st. No. 310. John Hutt, Parson's Mill, Cardenden.
 2nd. No. 308. Armstrong & Paull, 275 Watling Street, Leadgate, Durham.
 V. No. 312. Charles W. Wilson, The Gale, Abbey Town.
 H. No. 309. Ernest Grant, Baron Hill, Forfar.
 C. No. 311. John Johnston, Slates, Nitshill, Glasgow.

CLASS 52. GAME—Old English. Hen.

- 1st. No. 317. John Hutt, Parson's Mill, Cardenden.
 2nd. No. 313. Armstrong & Paull, 275 Watling Street, Leadgate, Durham.
 3rd. No. 318. Charles W. Wilson, The Gale, Abbey Town.
 V. No. 316. Ernest Grant, Baron Hill, Forfar.
 H. No. 314. Armstrong & Paull, 275 Watling Street, Leadgate, Durham.
 C. No. 315. James Davie, Inglis Street, Dunfermline.

CLASS 53. GAME—Indian. Cock.

- 1st. No. 320. Dr John K. Goodall, Brimington, Chesterfield.
 2nd. No. 324. John Penman, 1 James Place, Dunfermline.
 3rd. No. 319. William A. Black, Main Street, Polmont.
 V. No. 321. George Hunter, Blythe, Melrose.
 H. No. 322. Joseph M'Naughton, Old Polmaise, Stirling.

CLASS 54. GAME—Indian. Hen.

- 1st. No. 328. George Hunter, Blythe, Melrose.
- 2nd. No. 325. William A. Black, Main Street, Polmont.
- V. No. 329. John Penman, 1 James Place, Dunfermline.
- H. No. 326. Dr John K. Goodall, Brimington, Chesterfield.
- C. No. 327. W. Murray Guthrie, Duart Castle, Craigmore.

CLASS 55. GAME—Modern. Cock.

- 1st. No. 330. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
- 2nd. No. 334. Alexander Shepherd, Lily Cottage, Forfar.
- V. No. 331. Adam Innes, 213 Sinclairtown, Kirkcaldy.
- H. No. 332. Walter B. Longton, Walkinshaw, Renfrew.
- C. No. 333. William Melrose, Rosewell Mains, Rosewell (Black Red).

CLASS 56. GAME—Modern. Hen.

- 1st. No. 335. Robert Fitton, Ribby Hall, Kirkham, Lancashire.
- 2nd. No. 338. Alexander Shepherd, Lily Cottage, Forfar.
- V. No. 337. William Melrose, Rosewell Mains, Rosewell (Black Red).
- H. No. 336. Walter B. Longton, Walkinshaw, Renfrew.

CLASS 57. GAME—Any Variety, including Old English and Indian. Cockerel.

- 1st. No. 339. Robert Fitton, Ribby Hall, Kirkham, Lancashire (Modern).
- 2nd. No. 340. William Melrose, Rosewell Mains, Rosewell (Black Red).
- V. No. 341. Alexander Shepherd, Lily Cottage, Forfar.

CLASS 58. GAME—Any Variety, including Old English and Indian. Pullet.

- 1st. No. 342. Robert Fitton, Ribby Hall, Kirkham, Lancashire (Modern).
- 2nd. No. 344. Alexander Shepherd, Lily Cottage, Forfar.
- V. No. 343. William Melrose, Rosewell Mains, Rosewell (Black Red).

CLASS 59. BANTAM—Game, any Variety, including Old English and Indian. Cock.

- 1st. No. 352. John Morris, 129 Whitemyre, Dunfermline (Pile).
- 2nd. No. 349. Miss E. Fitton, Ribby Hall, Kirkham, Lancashire.
- 3rd. No. 346. Charles Aikman, Whins of Milton, Stirling.
- V. No. 350. John Hynd, 19 Parkneuk, Dunfermline (Pile).
- H. No. 345. Charles Aikman, Whins of Milton, Stirling.
- C. No. 351. William Melrose, Rosewell Mains, Rosewell (Black Red).

CLASS 60. BANTAM—Game, any Variety, including Old English and Indian. Hen.

- 1st. No. 353. Charles Aikman, Whins of Milton, Stirling.
- 2nd. No. 357. Miss E. Fitton, Ribby Hall, Kirkham, Lancashire.
- 3rd. No. 358. Miss E. Fitton, Ribby Hall, Kirkham, Lancashire.
- V. No. 355. James Allan, Castle Road, Winchburgh.
- H. No. 360. William Melrose, Rosewell Mains, Rosewell (Black Red).
- C. No. 359. John Hynd, 19 Parkneuk, Dunfermline (Pile).

CLASS 61. BANTAM—Any other Variety Bantam. Cock.

- 1st. No. 363. David Govan, 346 Great Eastern Road, Parkhead, Glasgow (Black Rosecomb).
- 2nd. No. 362. John Gillies, Edington Mills, Chirnside (Sebright).
- V. No. 365. Mrs R. W. Robin, Craigton Cemetery, Govan (Sebright).

CLASS 62. BANTAM—Any other Variety Bantam. Hen.

- 1st. No. 369. Lady Margaret Douglas Home, The Hirsell, Coldstream (Sebright).
- 2nd. No. 368. David Govan, 346 Great Eastern Road, Parkhead, Glasgow (Black Rosecomb).
- 3rd. No. 370. John Page, Hydropathic, Dunblane (Light Brahma).
- V. No. 367. David Govan, 346 Great Eastern Road, Parkhead, Glasgow (Black Rosecomb).
- H. No. 366. John Gillies, Edington Mills, Chirnside (Rosecomb).
- C. No. 371. Ernest H. Graham Stirling, Camp Cottage, Comrie (Polish).

CLASS 63. Any other recognised Breed of Poultry. Cock.

- 1st. No. 375. David M'Gibbon, Ard-na-Craig, Campbeltown (Spanish).
 2nd. No. 372. Robert Fitton, Ribby Hall, Kirkham, Lancashire (Poland).
 3rd. No. 376. Mrs D. Mackenzie, Maryfield, Meigle (Spanish).
 V. No. 378. A. Mitchell, The Bush, Rothesay (Silver Polish).
 H. No. 373. Peter Houston, 27 High Street, Dumbarton.
 C. No. 377. Joseph M'Naughton, Old Polmaise, Stirling (Ancona).

CLASS 64. Any other recognised Breed of Poultry. Hen.

- 1st. No. 386. John Meikle, Auchencruive Estates Office, Mount Hamilton, Ayr (Spanish).
 2nd. No. 380. Robert Fitton, Ribby Hall, Kirkham, Lancashire (Poland).
 3rd. No. 384. David M'Gibbon, Ard-na-Craig, Campbeltown (Spanish).
 V. No. 387. A. Mitchell, The Bush, Rothesay (Silver Polish).
 H. No. 381. David Hastings, Glaister Cottage, Darvel, Ayrshire (Crere).
 C. No. 385. Mrs D. Mackenzie, Maryfield, Meigle (Spanish).

CLASS 65. Any other recognised Breed of Poultry. Cockerel.

- 1st. No. 389. David M'Gibbon, Ard-na-Craig, Campbeltown (Spanish).
 2nd. No. 390. Mrs D. Mackenzie, Maryfield, Meigle (Spanish).
 V. No. 388. W. Murray Guthrie, Duart Castle, Craigmore (Lincoln Buff).

CLASS 66. Any other recognised Breed of Poultry. Pullet.

- 1st. No. 393. David M'Gibbon, Ard-na-Craig, Campbeltown (Spanish).
 2nd. No. 396. A. Mitchell, The Bush, Rothesay (Silver Polish).
 V. No. 392. A. & J. Borthwick, Corriedow, Tynron, Dumfriesshire (Andalusian).
 H. No. 394. Joseph M'Naughton, Old Polmaise, Stirling (Ancona).
 C. No. 395. Joseph M'Naughton, Old Polmaise, Stirling (Ancona).

CLASS 67. DUCKS—Aylesbury. Drake.

- 1st. No. 398. John Gillies, Edington Mills, Chirnside.
 2nd. No. 399. Countess of Home, The Hirsell, Coldstream.
 V. No. 397. John Gillies, Edington Mills, Chirnside.

CLASS 68. DUCKS—Aylesbury. Duck.

- 1st. No. 400. John Gillies, Edington Mills, Chirnside.
 2nd. No. 402. Countess of Home, The Hirsell, Coldstream.
 V. No. 401. John Gillies, Edington Mills, Chirnside.

CLASS 69. DUCKS—Aylesbury. Drake (Young).

- 1st. No. 405. Countess of Home, The Hirsell, Coldstream.
 2nd. No. 403. John Gillies, Edington Mills, Chirnside.
 V. No. 406. W. M. M'Call, Great Cross, Kirkcudbright.
 H. No. 404. John Gillies, Edington Mills, Chirnside.
 C. No. 407. James Paterson, Kidshielhaugh, Duns.

CLASS 70. DUCKS—Aylesbury. Duck (Young).

- 1st. No. 408. John Gillies, Edington Mills, Chirnside.
 2nd. No. 410. Countess of Home, The Hirsell, Coldstream.
 3rd. No. 411. Countess of Home, The Hirsell, Coldstream.
 V. No. 409. John Gillies, Edington Mills, Chirnside.
 H. No. 412. W. M. M'Call, Great Cross, Kirkcudbright.
 C. No. 413. James Paterson, Kidshielhaugh, Duns.

CLASS 71. DUCKS—Rouen. Drake.

- 1st. No. 415. John Gillies, Edington Mills, Chirnside.
 2nd. No. 417. A. Mitchell, The Bush, Rothesay.
 V. No. 416. Peter Houston, 27 High Street, Dumbarton.

CLASS 72. DUCKS—Rouen. Duck.

- 1st. No. 418. John Gillies, Edington Mills, Chirnside.
 2nd. No. 419. John Gillies, Edington Mills, Chirnside.

CLASS 73. DUCKS—Any other Variety. Drake.

- 1st. No. 421. S. Dalgleish, Blackburn, Chirnside (Pekin).
- 2nd. No. 422. S. Dalgleish, Blackburn, Chirnside (Pekin).
- 3rd. No. 425. Owen Phillips, Bredon Lodge, Tewkesbury, Gloucester (Pekin).
- V. No. 423. Dickson Brothers, Mouswald, Ruthwell, E.S.O. (Pekin).
- H. No. 424. John B. Malcolm, Auchterarder Castle, Auchterarder (Pekin).
- C. No. 426. Lady Wilson, Chillingham Barns, Belford, Northumberland (Cayuga).

CLASS 74. DUCKS—Any other Variety. Duck.

- 1st. No. 428. S. Dalgleish, Blackburn, Chirnside (Pekin).
- 2nd. No. 430. Owen Phillips, Bredon Lodge, Tewkesbury, Gloucester (Pekin).
- V. No. 429. John B. Malcolm, Auchterarder Castle, Auchterarder (Pekin).
- H. No. 427. S. Dalgleish, Blackburn, Chirnside (Pekin).
- C. No. 431. Lady Wilson, Chillingham Barns, Belford, Northumberland (Cayuga).

CLASS 75. DUCKS—Any Breed (Aylesbury excepted). Drake (Young).

- 1st. No. 434. Countess of Home, The Hirsell, Coldstream (Rouen).
- 2nd. No. 432. S. Dalgleish, Blackburn, Chirnside (Pekin).
- V. No. 433. John Gillies, Edington Mills, Chirnside (Rouen).
- H. No. 435. Owen Phillips, Bredon Lodge, Tewkesbury, Gloucester (Pekin).

CLASS 76. DUCKS—Any Breed (Aylesbury excepted). Duck (Young).

- 1st. No. 437. John Gillies, Edington Mills, Chirnside (Rouen).
- 2nd. No. 438. Countess of Home, The Hirsell, Coldstream (Rouen).
- V. No. 436. S. Dalgleish, Blackburn, Chirnside (Pekin).
- H. No. 439. Owen Phillips, Bredon Lodge, Tewkesbury, Gloucester (Pekin).

CLASS 77. GEESE. Gander.

- 1st. No. 440. Alexander Shanks, Cuthelton Farm, Denny (Toulouse).

CLASS 78. GEESE. Goose.

- 1st. No. 441. Miss Shanks, Cuthelton Farm, Denny (Toulouse).

CLASS 79. TURKEYS. Cock.

- 1st. No. 442. Robert Clark, Taybank, Errol (Bronze).
- 2nd. No. 446. Robert Lawson, Annfield, Stirling (Bronze).
- 3rd. No. 445. Mrs Hunter, Anton's Hill, Coldstream.
- V. No. 448. Lady Wilson, Chillingham Barns, Belford, Northumberland (Bronze).
- H. No. 447. Miss Shanks, Cuthelton Farm, Denny (Bronze).
- C. No. 444. Alexander Duncan, Hydropathic, Dunblane (Bronze).

CLASS 80. TURKEYS. Hen.

- 1st. No. 449. George A. Bell, Lundin Mill Farm, Largo, Fife (Bronze).
- 2nd. No. 457. Lady Wilson, Chillingham Barns, Belford, Northumberland (Bronze).
- 3rd. No. 454. John Page, Hydropathic, Dunblane.
- V. No. 452. Robert Lawson, Annfield, Stirling (Bronze).
- H. No. 455. Miss Shanks, Cuthelton Farm, Denny (Bronze).
- C. No. 453. Robert Lawson, Annfield, Stirling (Bronze).

DAIRY PRODUCE

CLASS 1. CURED BUTTER, not less than 7 lb.—Premiums, £4, £2, and £1.

- 1st. No. 7. Andrew Fleming, Threepeland, Eaglesham.
- 2nd. No. 13. William Paterson, Barnago, Denny.
- 3rd. No. 8. Robert Gilmour, Stonebyres, Eaglesham.
- V. No. 15. W. C. Whyte, Middlepenny, Langbank.
- H. No. 3. Robert Chalmers, Duntilland, Holytown.
- C. No. 5. William Duncan, Easter Shieldhill, by Falkirk.

CLASS 2. POWDERED BUTTER, not less than 7 lb.—Premiums, £4, £2, and £1.

- 1st. No. 29. Henry Orr, Torrance, Blackridge, Westcraigs
 2nd. No. 32. W. C. Whyte, Middlepenny, Langbank.
 3rd. No. 27. R. G. Murray, Spittal, Biggar.
 V. No. 25. Robert Gilmour, Stonebyres, Eaglesham.
 H. No. 24. Andrew Fleming, Threepland, Eaglesham.
 C. No. 28. Thomas Nimmo, Lawhead, Forth, by Lanark.

CLASS 3. FRESH BUTTER, Three 1-lb. Rolls.—Premiums, £4, £2, and £1.

- 1st. No. 41. Alexander Fleming, Enoch, Eaglesham.
 2nd. No. 51. William Paterson, Barnego, Denny.
 3rd. No. 49. Thomas Nimmo, Lawhead, Forth, by Lanark.
 V. No. 39. William Duncan, Easter Shieldhill, by Falkirk.
 H. No. 44. Robert Gilmour, Stonebyres, Eaglesham.
 C. No. 52. William Rennie, Parkhead, Slamannan.

CLASS 4. CHEDDAR CHEESE, 56 lb. and upwards.—
Premiums, £6, £4, £2, and £1.

- 1st. No. 58. Matthew Kerr, Craiglemine Farm, Whithorn, N.B.
 2nd. No. 54. Alex. Cross, Knockdon, Maybole.
 3rd. No. 57. Adam Henry, Culmore Farm, Stoneykirk, Stranraer.
 4th. No. 61. Robert Montgomerie, Lessnessock, Ochiltree.
 V. No. 59. William M'Master, Challock, Dunragit.
 H. No. 60. William M'Master, jun., Cruggleton, Whithorn.

CLASS 5. CHEDDAR CHEESE, 14 lb. and under. —
Premiums, £3, £2, and £1

- 1st. No. 64. William M'Master, Challock, Dunragit
 2nd. No. 66. Robert Montgomerie, Lessnessock, Ochiltree.
 3rd. No. 62. Alex. Cross of Knockdon, Maybole
 V. No. 65. William M'Master, jun., Cruggleton, Whithorn.

J U D G E S

Shorthorn.—Arthur S. Gibson, The Elms, Ruddington, Nottingham; D. C. Bruce, Byres, Fochabers.

Aberdeen-Angus.—Andrew Mackenzie of Dalmore, Alass, N.B.; Daniel Robert son, Mains of Fordie, Dunkeld.

Galloway.—John M'Cormick, Loch ank, Dalbattie, Andrew Montgomery, Netherhall, Castle-Douglas.

Highland.—John Campbell, (Calvine Farm, Calvine, Perthshire; John Mac phail, Auchnacraig, Craignure, Isle of Mull.

Ayrshire.—Alexander Y. Allan, Croft-jane, Thornhill.

Jersey.—T. H. Weetman, Rose Hill, Atherstone, Warwickshire.

Stallions, Entic Culls, and Draught Geldings.—Richard Dunn, Udston, Ham-ilton; John Morrison, Hattonslap, Old Melkdrum.

Mares and Fillies.—John Kerr, Red Hall, Wigton, Cumberland; A. M'Robbie, Sunnyside, Aberdeen.

Hunters.—George Dove, Whitehouse, St Boswells; J. W. J. Paterson, Terrona, Langholm.

Hackneys.—Alfred Craggy, North Newbold, Brough, Yorks.

Ponies.—R. Brydon, The Dene, Sea ham Harbour.

Shetland Ponies.—Gavin Hadden, Dal munzie, Murtle, Aberdeen.

Blackface.—Alexander Cowan, Spit-talhill, Fintry, W. J. Murray, Heriot House, Heriot; Robert Watson, Culter allers, Biggar.

Chenot.—John Murray, Parkhall, Douglas, John Scott, Newton, Hawick.

Border Leicester.—James K. Smith, Leaston, Upper Keith, Matthew Rudley, Peelwell, Haydon Bridge.

Half Bred.—Andrew Dun, Laidlaw-stiel, Galashiels; William Hindmarsh, Ilderton, Alnwick.

Shropshire.—Alfred Tanner, Shra-wardine, Shrewsbury.

Oxford Down.—J. H. Toppin, Mus-grave Hall, Skelton, Penrith.

Suffolk.—S. R. Sherwood, Playford, Ipswich.

Fat Sheep.—Robert Thomson, 29 Port Street, Stirling.

Swine.—Robert Wallace, Auchenbrain, Mauchline.

Poultry.—Alexander M. Prain, Rawes, Longforgan.

Dairy Produce.—Hugh Osborne, 45 Candleriggs Street, Glasgow.

Wool.—Alexander Macnaughton, manu-facturer, Pitlochry.

ATTENDING MEMBERS

Shorthorn.—Robert Paterson, John Murray, D. M'Laren, Robert Buchan, A. C. Buchanan.

Aberdeen-Angus.—C. M. Cameron, W. T. Malcolm, John Edmond, J. T. M'Laren, D. Fisher.

Galloway.—Sir Alan H. Seton Steuart, William Duthie, Charles Carrick, James Paterson.

Highland.—Sir Archibald Buchan Hepburn, Bart., Parlan Macfarlan, James M'Lachlan, M. C. Stark, D. Ballingall.

Ayrshire.—John Macpherson-Grant, David Edmond, James Sands.

Jersey.—John Craig, W. A. Dron.

Stallions, Entire Colts, and Draught Geldings.—Captain Clayhills Henderson, R. Sinclair Scott, John M'Caig, Alexander Park, David Buchanan, Andrew Dewar.

Mares and Fillies.—John M. Martin, George Dun, William Clark, James M'Laren, A. H. Anderson, Dean of Guild Macfarlane.

Hunters.—Colonel H. S. Home Drummond, Edwin Bolton, A. T. Arrol.

Hackneys.—T. Gordon Duff, Alexander

Cross, Hugh B. P. Brock, W. Watson Murray.

Ponies.—C. H. Scott Plummer, John J. Moubray, James Renton, Adair Campbell.

Shetland Ponies.—John Cran, Claude H. Hamilton, Councillor James Thomson.

Blackfaced.—John Speir, John Marr, Thomas Watters, James Lumsden.

Cheviot.—Captain C. Home Graham Stirling, D. A. Kinross, Charles Brown.

Border Leicester.—John Wilson, James Rodger, C. J. B. Macfarlan.

Half-Bred.—R. Shirra Gibb, James Fleming.

Shropshire.—E. Hedley Smith, James W. Drummond.

Oxford Down.—James Lockhart.

Suffolk.—Sir Robert Moncreiffe, Bart.

Fat Sheep.—Andrew Hutcheson.

Swine.—William M'Laren.

Poultry.—Provost Forrest, Bailie Steel, Parlan Macfarlan.

Dairy Produce.—Robert Taylor, John Duacan.

Wool.—James Peebles, Robert Buchanan.

DISTRICT COMPETITIONS.

17 Districts—Grants of £12 each (Section I.) (Less £2 not awarded)	£202	0	0
6 " Grants of £15 each (Section II)	90	0	0
5 " Special Grants	31	0	0
66 " Medals for Shows	42	1	6
25 " Medals for Cottages and Gardens	6	0	10
191 " Medals for Ploughing	46	3	2
310	£420	5	6

VETERINARY DEPARTMENT.

33 Silver Medals	£21	0	9
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AGRICULTURAL CLASS, EDINBURGH UNIVERSITY.

3 Prizes—£4, £3, £3	£10	0	0
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ABSTRACT OF PREMIUMS.

Stirling Show	£2596	15	3
District Competitions	120	5	6
Veterinary Colleges	21	0	9
Agricultural Class, Edinburgh University	10	0	0
Medal to Messrs R. & J. Garton	7	10	0
	£3055	11	6

STATE OF THE FUNDS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY

OF SCOTLAND

As at 30th NOVEMBER 1900.

I. HERITABLE BONDS—			
£11,500 at $3\frac{1}{2}$ per cent, £11,500 at $3\frac{1}{2}$ per cent, £11,500 at 3 per cent			£34,500 0 0
II. DEBENTURE AND PREFERENCE STOCKS—			
£4,250 N.B. Railway Co 3 per cent, at 101 $\frac{1}{2}$	£4,313 15 0		
£2,727 Caled. Railway Co. 4 per cent, at 137	3,735 19 9		
£2,347 London and North-Western Railway Company 3 per cent, at 104 $\frac{1}{2}$	2,452 12 3		
£1,212 Mid. Railway Co. 2 $\frac{1}{2}$ per cent, at 85 $\frac{1}{2}$	1,039 5 9		
£2,400 Do. do. Preference Stock 2 $\frac{1}{2}$ per cent, at 82 $\frac{1}{2}$	1,983 0 0		
£1,036 N.E. Railway Co. 3 per cent, at 103	1,067 1 7		
£1,026 Gt. N. Railway Co. 3 per cent, at 102 $\frac{1}{2}$	1,049 1 8		
			15,640 16 0
III. BANK STOCKS —			
£6,407 7 8 Royal Bank of Scotland, at 249	£15,951 7 8		
2,218 16 5 Bank of England, at 328 $\frac{1}{2}$	7,288 16 6		
2,500 0 0 British Linen Co Bank, at 470	11,750 0 0		
2,341 13 4 Bank of Scotland, at 327	7,657 5 0		
			42,650 9 2
£13,467 17 5			
The original cost of these Bank Stocks was £23,632, 9s 4d., showing a profit at present prices of £19,017, 19s 10d.			
IV. ESTIMATED VALUE of Building, No. 3 George IV. Bridge			
			3,100 0 0
V. ESTIMATED VALUE of Furniture, Paintings, Books, &c.			
			1,000 0 0
VI. ARREARS of SUBSCRIPTIONS considered recoverable			
			97 17 0
VII. BALANCE DUE BY ROYAL BANK OF SCOTLAND ON ACCOUNTS CURRENT, at 30th November 1900			
			2,477 15 11
AMOUNT OF GENERAL FUNDS			£99,466 18 1
VIII. TWEEDDALE MEDAL FUND—			
Heritable Bond, at $3\frac{1}{2}$ per cent			£500 0 0
IX. THE ROBERT MURDOCH PRIZE FUND—			
Legacy by the late Miss Murdoch, Blantyre, to be applied in giving a prize of £10 a-year, while it lasts, to the Breeder of the best Clyde-dale Brood Mare at the Annual Show of the Society, £100, less duty.			
Amount per last account, including interest			£80 14 5
Interest on Deposit Receipt, dated 13th July 1899, and up-lifted 2nd October 1900			2 10 9
			£83 5 2
Transferred to Stirling Show Account			10 0 0
On Deposit Receipt with Royal Bank, dated 2nd October 1900			£73 5 2

JAS. H. GIBSON-CRAIG, *Treasurer.*

ALEX. M. GORDON, *Member of Finance Committee.*

WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 9th January 1901.

VIEW OF RECEIPTS AND PAYMENTS

For the Year 1899-1900.

RECEIPTS.

1. ANNUAL SUBSCRIPTIONS AND ARREARS received	£920	2	0
2. LIFE SUBSCRIPTIONS	1,077	5	0
			£1,997 7 0
3. INTERESTS AND DIVIDENDS—			
Interests	£1,501	8	9
Dividends	1,561	11	4
			<hr/> 3,063 0 1
4. TRANSACTIONS			39 16 4
5. RECEIPTS from Stirling Show	7,769	4	11
6. INCOME TAX repaid for three years to 31st December 1899	291	13	11
SUM OF RECEIPTS	£13,161	2	3

PAYMENTS.

1. ESTABLISHMENT EXPENSES—			
Salaries and Wages	£1,212	0	0
Fou -duty, Taxes, Coals, Gas, Insurances, Repairs, and Furnishings	153	16	10
			£1,365 16 10
2. FEE TO AUDITOR of Accounts for 1898-99	50	0	0
3. EDUCATION	238	6	1
4. DAIRY DEPARTMENT	110	0	7
5. CHEMICAL DEPARTMENT	296	0	10
6. VETERINARY DEPARTMENT	132	15	6
7. BOTANICAL DEPARTMENT	38	18	0
8. TRANSACTIONS	748	4	11
9. ORDINARY Printing, Advertising, Stationery, Post- ages, Bank Charges, &c.	220	6	10
10. GRANTS to Public Societies	25	0	0
11. GRANT to Professor Connor Ewart	200	0	0
12. LAW EXPENSES	15	19	1
13. MISCELLANEOUS	105	15	4
14. PAYMENT in connection with Kelso Show	3	0	0
15. PAYMENTS in connection with Edinburgh Show	131	13	11
16. PAYMENTS in connection with Stirling Show—			
Premiums	£2,449	15	3
General Expenses	4,094	1	8
			<hr/> 6,543 16 11
17. PREMIUMS for District Competitions and Cottages and Gardens	447	3	9
SUM OF PAYMENTS			10,672 18 7
BALANCE OF RECEIPTS			<hr/> <u>£2,488 8 8</u>

JAS. H. GIBSON-CRAIG, *Treasurer.*

ALEX. M. GORDON, *Member of Finance Committee.*

WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 9th January 1901.

AGRICULTURAL SOCIETY of SCOTLAND for the Year 1899-1900.

DISCHARGE.

1. ESTABLISHMENT EXPENSES—		
Salaries and Wages	£1,212 0 0	
Feu-duty, £28; Taxes, £41, 14s.	69 14 0	
Coals and Gas	30 17 0	
Insurances	16 19 2	
Repairs and Furnishings—Special, £3, 10s. 6d.; Ordinary, £32, 16s. 2d.	86 6 8	
	£1,865 16 10	
2. FEE to Auditor of Accounts for 1898-99	50 0 0	
3. EDUCATION—		
(1) Forestry—Vote to Chair in Edinburgh University	£50 0 0	
(2) Agriculture—Prizes to Agricultural Class in Edinburgh University, £10; Fees to Examiners, &c., £25, 8s.; Expenses of National Diploma Examinations at Leeds, £152, 18s. 1d.	£188 6 1	
	238 6 1	
4. DAIRY DEPARTMENT—		
(1) Examinations—Fees to Examiners, £25, 4s.; Travelling Expenses, £3, 6s. 2d.; Hotel Bill, £7, 10s. 5d.; Advertising, Fees, &c., £18	£52 0 7	
Less—Forfeited entry fees	2 0 0	
	£50 0 7	
(2) Special Grants—Vote to Scottish Dairy Institute for 1900	60 0 0	
	110 0 7	
5. CHEMICAL DEPARTMENT—		
(1) Salary to Dr A. P. Aitken	£50 0 0	
(2) Chemists' Fees and Expenses—		
Fees for Analyses for Members, £94, 5s.; Do. in connection with Experiments, £43, 11s.	137 16 0	
(3) Expenses visiting Experiments	8 4 2	
(4) Manures for Experiments	40 0 8	
(5) Expenses of Sheep-Feeding Experiments	60 0 0	
	296 0 10	
6. VETERINARY DEPARTMENT—Principal Williams, £26, 5s.; Tuberculosis Research, £85, 9s. 9d.; Medals, £21, 0s. 9d.	132 15 6	
7. BOTANICAL AND ENTOMOLOGICAL DEPARTMENT—Fee to Botanist for year, £25; Investigation as to Disease in Swedes, £10, 15s.; Clover Sickness Experiments, £3, 3s.	38 18 0	
8. TRANSACTIONS	748 4 11	
9. ORDINARY Printing, £31, 4s. 3d.; Advertising, £16, 12s. 8d.; Stationery, &c., £44, 4s. 5d.; Postages, £70; Bank Charges, &c., £8, 5s. 6d.	220 6 10	
10. GRANTS to Public Societies—Scottish Meteorological Society, £20; Society for Prevention of Cruelty to Animals, £5	25 0 0	
11. GRANT to Professor Cossar Ewart in connection with Telegony Experiments	200 0 0	
12. LAW EXPENSES	15 19 1	
13. MISCELLANEOUS EXPENSES	105 15 4	
14. INVESTMENT made	2,000 1 6	
15. PAYMENT in connection with Kelso Show, 1898—Premium	3 0 0	
16. PAYMENTS in connection with Edinburgh Show, 1899—Premiums, £110; Miscellaneous Payments, £21, 13s. 11d.	131 18 11	
17. PAYMENTS in connection with Stirling Show, 1900—Premiums, £2440, 15s. 3d.; Expenses, £4094, 1s. 8d.	6,548 16 11	
18. PREMIUMS and Medals for District Competitions	447 3 9	
19. ARREARS struck off as irrecoverable	38 12 0	
20. ARREARS outstanding at 30th November 1900	97 17 0	
21. BALANCE due by Royal Bank on Account Current	2,477 15 11	
SUM OF DISCHARGE	£15,287 5 0	

JAS. H. GIBSON-CRAIG, *Treasurer.*

ALEX. M. GORDON, *Member of Finance Committee.*

WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 9th January 1901.

ABSTRACT of the ACCOUNTS

CHARGE.

1. LOCAL SUBSCRIPTIONS—

Voluntary Assessment, Stirlingshire	£368 12 11
" " Western District of Perthshire	84 8 5
" " Clackmannanshire	60 0 0
General Subscription—Dumbartonshire	193 5 10
Donation by the Town of Stirling	100 0 0
" by the Wine, Spirit, and Beer Trade Association of Stirling	32 0 0
	<hr/>
	£838 7 2

2. AMOUNT COLLECTED DURING SHOW—

Drawn at Gates	£3,464 6 0
Drawn at Grand Stand	552 9 8
Catalogues and Awards sold	279 13 1
Lavatories and Cloak-Rooms	8 8 9
	<hr/>
	4,304 17 6
3. FORAGE SOLD	8 0 7
4. RENT OF STALLS	2,054 10 0
5. RENT OF REFRESHMENT BOOTHS	250 0 0
6. ADVERTISING IN CATALOGUE AND PREMIUM LIST	96 1 1
7. SPECIAL PRIZES CONTRIBUTED	198 10 0
8. INCOME FROM TWEEDDALE MEDAL FUND	16 14 10
9. INTEREST FROM ROYAL BANK	12 3 9

£7,769 4 11

Note.—From the above balance of £1,225 8 0
 There has to be deducted the premiums undrawn at 30th
 November, amounting to 147 0 0
 Making the probable Surplus £1,078 8 0

of the STIRLING SHOW, 1900.

DISCHARGE.

1. SHOWYARD EXPENDITURE—

Fitting up Showyard	£2,591 10 0
Rent of King's Park	100 0 0
Forming connections between Town Sewers and Showyard	15 0 0
Rosettes, £22; Penning, &c., Poultry, £4, 15s. 3d.	26 15 3
Miscellaneous	11 19 0

£2,745 4 3

2. FORAGE 280 6 3

3. POLICE 36 19 6

4. TRAVELLING EXPENSES of Judges, Stewards, &c. 99 7 1

5. HOTEL AND LUNCHEONS—

Hotel Bill for 38 Directors, 8 Stewards, 35
Judges, &c. £145 9 4

Luncheons and Breakfasts, &c., in Showyard for
Judges, Directors, Attending Members, &c. 161 4 10

306 14 2

6. MUSIC 43 12 6

7. PRINTING 244 19 0

8. ADVERTISING and Bill-posting 111 11 10

9. HIGHLAND INDUSTRIES 7 6 6

10. VETERINARY INSPECTION 10 10 0

11. CONCERT for Attendants 5 0 0

12. ASSISTANTS and Attendants 140 10 8

13. POSTAGES 48 10 0

14. MISCELLANEOUS 13 9 11

AMOUNT OF GENERAL EXPENDITURE £4,094 1 8

15. PREMIUMS drawn at 30th November 2,449 15 3

£6,543 16 11

BALANCE OF RECEIPTS 1,225 8 0

£7,769 4 11

JAS. H. GIBSON-CRAIG, *Treasurer.*ALEX. M. GORDON, *Member of Finance Committee.*WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 9th January 1901.

ABSTRACT of the ACCOUNTS of the

CHARGE.

I. FUNDS as at 30th November 1899—

£3,193, 6s. 8d. 3 per cent Debenture Stock of the North British Railway Company, purchased at	£2,650	0	0
Heritable Bond at 3 per cent	3,500	0	0
£550 Lancashire and Yorkshire Railway Company, 3 per cent Debenture Stock, purchased at	611	10	6
	<hr/>		
	£6,761	10	6

BALANCES in Royal Bank —

On Deposit Receipt, dated 3rd February 1898	£100	0	0
On Current Account	271	12	9
	<hr/>		
	371	12	9
	£7,133	3	3

II. INCOME—

1 Interest on Investments—

On £3,193, 6s. 8d. 3 per cent Debenture Stock of the North British Railway Company, £95, 16s, tax £4, 3s 4d	491	12	8
On £3,500 on Heritable Bond at 3 per cent, £105, tax £4, 11s 4d	100	8	8
On £550 Lancashire and Yorkshire Railway Company 3 per cent Debenture Stock, £24, 15s, tax 17s 11d.	23	17	1
	<hr/>		
	£215	18	5

2 Income-tax repaid for three years to 31st December 1899	24	2	0
	<hr/>		
	240	0	5

SUM OF CHARGE £7,373 3 8

ARGYLL NAVAL FUND for Year 1899-1900.

DISCHARGE.

I. ALLOWANCE to the five following Recipients—

Malcolm H. S. Macdonald (fourth year)	£40 0 0
Edward L. Grieve (sixth year)	40 0 0
Percy L. H. Noble (sixth year)	40 0 0
James Douglas Campbell (second year)	40 0 0
John Stewart Gordon Fraser (second year)	40 0 0
	<hr/>
	£200 0 0

II. FUNDS at 30th November 1900—

£3,193, 6s. 8d. 3 per cent Debenture Stock of the North British Railway Company, pur- chased at	£2,650 0 0
Heritable Bond at 3 per cent	3,500 0 0
£550 Lancashire and Yorkshire Railway Com- pany 3 per cent Debenture Stock, purchased at	611 10 6
	<hr/>
	£6,761 10 6

Balances in Royal Bank—

On Deposit Receipt, dated 3rd February 1898	£100 0 0	
On Current Account	311 13 2	
	<hr/>	
	411 13 2	
	<hr/>	7,173 3 8

SUM OF DISCHARGE . . . £7,373 3 8

JAS. H. GIBSON-CRAIG, *Treasurer.*

ALEX. M. GORDON, *Member of Finance Committee.*

WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 9th January 1901.

PROCEEDINGS AT BOARD MEETINGS.

MEETING OF DIRECTORS, 7TH MARCH 1900.

Present.—*Vice-Presidents*—The Earl of Moray, and Sir Robert Menzies of Menzies, Bart. *Ordinary Directors*—Mr John Speir, Newton Farm; Mr George Dun, Woodmill; Mr David Wilson of Carbeth; Mr John M'Hutchen Dobbie, Campend; Mr Alexander Cross of Knockdon; Mr John M'Caig, Challoch; Mr Jonathan Middleton, Clay of Allan; Mr E. Hedley Smith, B.L., Whittinghame; Mr William Clark, Netherlea; Sir Alan H. Seton Stewart of Touch, Bart.; Mr R. Shirra Gibb, Boon; Mr R. W. B. Jardine, yr. of Castlemilk; Mr John Murray, Munninston; Rev. John Gillespie, LL.D., Mouswald Maise; Mr C. M. Cameron, Balnakyle; and Mr C. H. Scott Plummer of Sunderland Hall. *Extraordinary Directors*—Captain C. Hoine Graham-Stirling of Striowan; Mr R. C. Mackenzie of Edinburgh; Mr John Edmond, Galamuir; Mr Andrew Hutcheson, Beechwood; Mr John Wilson, Chapelhill; Mr John Cran, Kirkton; and Sir Ralph Anstruther of Balcaskie, Bart. *Treasurer*—Sir James H. Gibson-Craig of Riecarton, Bart. *Honorary Secretary*—Sir John Gilmour of Montrave, Bart. *Chemist*—Dr A. P. Aitken. *Auditor*—Mr William Home Cook, C.A. Mr A. M. Gordon of Newton in the chair.

On the request of Sir JAMES GIBSON-CRAIG it was agreed to grant Major Dundas two months' leave of absence on account of his proceeding to the front.

THE LATE MR LUMSDEN.

The CHAIRMAN said that before proceeding with the business of the day he had to perform what, they would believe him, was one of the most painful duties he had ever had to discharge in the course of his life, and that was to move that the Directors express in their minutes the great loss they had sustained by the death of Mr Lumsden of Balmedie. Mr Lumsden had given his services to them for very many years with great acceptance, and he was sure that every one must regret very deeply the loss which not only they as a Society, but the agriculturists throughout Scotland, had sustained through his death. Mr Lumsden united in himself in an exceptional degree shrewd common-sense with a marvellous gift of wit and repartee. He might safely say that there would be no one more missed and more regretted than Mr Lumsden by the Directors and agriculturists of Scotland, and he moved that an expression of regret be recorded in the minutes.

Dr GILLESPIE seconded, and the motion was agreed to unanimously, the members upstanding during the time of the Chairman's remarks.

THE PENICUIK EXPERIMENTS.

The SECRETARY read a letter from Professor Cossar Ewart, The Bungalow, Penicuik, in which he acknowledged receipt of £200 as a donation voted by the Board to assist in defraying the cost of the important experiments in stock-breeding which he has been carrying on.

STIRLING SHOW, 1900.

The SECRETARY intimated that since last meeting, when the premium-list was passed, he had received intimation of special prizes from Mr Buttar on behalf of

breeders of Shropshire sheep in the counties of Perth and Forfar, amounting to £10, in prizes of £5, £3, and £2, for pens of cross-bred lambs in class 104, got by Shropshire tups. After consulting with the Chairman, he had embodied these prizes in the premium-list as sent out, as they had been accepted in former years.

The action of the Chairman and Secretary was formally approved. It was remitted to the local committee along with Mr Ferguson and the Secretary to arrange for the usual concert for attendants at the Show.

HIGHLAND COWS.

The SECRETARY read a letter which he had received from the Highland Cattle Society, recommending that the conditions attached to the class of Highland cows at the Highland Show be altered to the following: "Cows with calf at foot and in milk." The Secretary, in remitting the request, said that it was unanimously resolved at the meeting of the Highland Cattle Society at Oban to make the request to the Directors, as it might be found that cows with calves at foot might not be in milk. Some of the members of the Society expressed themselves as satisfied with the regulation as at present standing, but the majority were in favour of having it altered.

Sir ROBERT MENZIES said that as he was the member of council who brought this matter before the Board, and as the present wording of the rule was adopted on his suggestion, he regretted that the Society had not seen their way to accept it. He thought his own way the best. They would remember that Dr Gillespie had said on one occasion that a Highland cow might have a calf at foot and be barren. Now that was a thing that might happen on the Borders, but he did not think it would appear in connection with the Highland cattle. He personally had no objection to the alteration of the rule. A Highland cow was not supposed to have a calf till she was four years old, and a good heifer could gain prizes as a yearling, two-year-old, and three-year-old, and it might be that they had come out as cows supposed to be in calf, and got prizes, but were after several months found to have been barren.

The CHAIRMAN recommended that seeing that the premium-list for Stirling Show had been issued, it might be remitted to the Show Committee to consider as to the advisability of adopting it next year.

Dr GILLESPIE said that the uniform rule of the Society was that all cows must have calves previous to being shown, and although he was not to testify as to what might have happened in the Borders, he believed it was on record that an animal was exhibited, and took first prize as a Highland cow, that never had a calf at all.

The Chairman's suggestion was agreed to.

MILK STANDARD.

The SECRETARY read a letter from the secretary to the Departmental Committee inviting the Society to recommend a witness on behalf of the Society on the subject of milk standards.

Mr HUTCHESON said that he thought the Society ought to give a very definite expression of opinion on this matter, and they ought to be represented before the Committee. He had before him a record of analysis of twenty-nine samples of milk, most of which showed from 4.2 to 5 per cent, and only two of them were under the standard of 2.50 per cent sought to be set up by some people, and one of these had been watered to the extent of 18 per cent. His idea was that if the standard of milk was struck so low as some people wanted it, the general quality would be reduced to meet the standard, and he thought it would be a great loss to the consumer, and especially children. His idea was that a 3 per cent standard was quite low enough, and the Society should not support anything less than the 3 per cent. It was a most important question for the British public as consumers.

Mr M'CAIG, speaking for the people of the south-west of Scotland, said the lower standard was distinctly in favour of those who bought the milk. He would suggest that whoever was sent by the Society should be prepared to recommend that the standard be 3 per cent. They should send a man who had himself had practical experience of the milk trade.

Dr GILLESPIE desired to endorse what had been said. It was a subject which he personally had no intimate knowledge of, but representation had been made to him by most experienced persons in the matter. He knew a company which had made upwards of ten thousand analysis during the last four years, and they have insisted upon a gradual rise of the standard, and they have succeeded in securing it, for their present standard, they admitted, was considerably higher than that which the gentleman who had spoken had mentioned. He thought that their duty lay in seeking to get a standard at all events of 3 per cent.

Mr SPEIR said that he personally had made several thousands of analysis of the

actual milk as it came from the cow. There was one great difficulty in analysing milk and that was that the gentleman making the analysis had no knowledge that he was analysing it as it came from the cow. The analysis only showed the quality of milk sold in that particular district. As far as his own experience went, he did not think it possible that farmers would in any way be harassed if a minimum of 3 per cent were demanded. The only thing would be that the consumer would have to pay a little more for it, but then the enhanced value of the quality would demand that. There was no reason why the public in the city should not get as good milk as the resident in the country, if they got every one to do what was correct. If Government made the standard as low as 2 60 the good milk would be reduced to that standard. Cream was really a manufactured product, and there was no difficulty in giving it up to anything that the Government required.

Mr M HUTCHEN DOBBIE was of opinion that the quality of milk might depend on the food of the cow.

The CHAIRMAN asked Mr Speir if he meant that the standard should be fixed so hard and fast that prosecution would follow the selling of milk under 3 per cent.

Mr SPEIR was not prepared to go so far. He was not prepared to say that they had not individual cows that would give milk of a lower quality but that was not owing to the food. But, on the other hand, communities were not supplied by a single cow, and in the case of a single cow it would be within the bounds of possibility to prove that the milk was really genuine. It had been proved over and over again that there was not a sample of milk drawn from a mixture of the produce of several cows that under any circumstances of feeding ever came down to 3 per cent.

Mr M CAIG pointed out that in the county which he represented which was certainly a very important one in the dairy line, the standard which the creameries set was 3 40 in summer and 3 60 in winter, and if the milk went below that the farmer had to take less for it.

Mr HUTCHESON said it was the same in his district.

Mr M CAIG proposed that Mr Speir be sent to represent them before the Committee, and this was unanimously agreed to.

REPORTS OF AGRICULTURAL PRICES

Mr JOHN M HUTCHEN DOBBIE moved that, in view of the unsatisfactory reports of Scottish agricultural prices published from week to week, the Board of Directors urge the Board of Agriculture to collect and publish official reports of the prices at the weekly markets and sales of agricultural produce in Scotland. He said that a similar motion was carried at the December meeting of the Scottish Chamber of Agriculture and that Mr Long expressed himself as practically in favour of something being done. But the Scottish Chamber asked that the Act of 1882 be extended to Scotland. Under that Act certain towns in England—about 197—give in a return. Here they had to depend on the returns sent in by the market officers and the antiquated Fairs Court which they knew something about. The mode of striking the fair prices was anything but satisfactory. In Edinburgh they were supposed to sell to a set weight but that was not the case. They sold on a price which was agreed upon by the buyer and seller and it was not the price in the market but the price on rail, and then they weighed up to a certain weight. In England the officer who made the returns had a scale of weights fixed by Government, and the weights were 60 lb for wheat, 50 lb for barley, and 39 lb for oats. The reports of sales of stock in the newspapers were very unsatisfactory. They were given as a rule by the auctioneers and it was only natural that they should give reports as favourable as possible.

Mr JOHN WILSON seconded the motion, and referred to the unsatisfactory way reporting sales. They had the information that a bullock had been sold at a sterling but they had no information as to the weight. At Berwick on Tweed, when he sold his grain there was a rule that the buyer must return the amount of the purchase and the price, and there was an officer for the purpose of taking that information and if he was not satisfied with the amount of the quality and price he could ask the seller and if the buyer was found giving wrong information he would be liable in heavy penalty. He did not see why the law should not be the same in Scotland, and that they could have official information on which they could absolutely rely.

The motion was agreed to unanimously.

FINANCE

From a minute of the meeting of the Finance Committee that day it appeared that it was agreed to recommend to the Council that the statement of the general finance of the Society, submitted by Sir James Gibson Craig at the anniversary meeting, should be printed and published for the members. This was approved of.

ABORTION.

The following information of the scourge of abortion amongst cows, as prepared by Principal Williams of the New Veterinary College, was submitted to a meeting of that Committee of that day's date and adopted and agreed to be circulated :—

Causes.—Abortion amongst cows may be due to a variety of causes.

Abortion arising from an accident, or any other cause, often becomes contagious. Infectious abortion has long been known in this country.

Amongst the cases of abortion are the following—viz., impure water, unsound food, frosted food, offensive smells, disease, fright, over-exertion, accident, and the use of certain bulls.

Remedial Measures.—1. Underground drains at farm steadings should be replaced by surface drains, and these should be kept clean.

2. Liquid manure should be kept some distance from wells and streams of water.]

3. The floors of byres should be frequently flushed and kept clean, a little crude carbolic acid, say 2 ounces to a bucketful, being added to the water.

4. All aborted cows, and those showing signs of abortion, should be immediately isolated, the after-birth (generally retained by aborted cows) to be removed and destroyed.

5. The calf-bed and passages of aborted cows should be disinfected; and for this purpose, and for a continuance of this operation—applied externally as well as internally to the genitals—I recommend the commercial chloride of zinc, 1 part in 1000 parts of water. It is less irritating, less poisonous, and much cheaper than other antiseptics or germicides. It costs from 6d. to 8d. per lb.

This action was approved of by the Board.

TUBERCULOSIS.

At a meeting of the Tuberculosis Committee, held that day, it was resolved to conduct investigations by microscopical examination of the milk of cows which had reacted to the tuberculin test, with the view of discovering the extent to which the bacilli of tuberculosis exist in such milk.

CROPS AND BIRDS.

The Committee dealing with the damage done to crops by birds agreed to again circularise proprietors and tenants as to the advisability of continuing their efforts for the destruction of these pests.

OTHER BUSINESS.

A letter was read from the general manager of the Glasgow Exhibition stating that the committee were unable to recommend a special section for arboriculture, and after some remarks by Sir Robert Menzies the matter dropped.

Principal M'CALL, on behalf of the subscribers, offered to present the Society with the painting in oil of the Clydesdale stallion Prince of Wales, and it was agreed to accept it with thanks.

MEETING OF DIRECTORS, 4TH APRIL 1900.

Present.—*Vice-Presidents*—The Earl of Moray; Sir Robert Menzies of Menzies, sta. *Ordinary Directors*—Mr John Speir, Newton Farm; Mr John M'Hutchen thibie, Campend; Mr Walter Elliot, Hollybush; Mr Alexander Cross of Knockdon; st W. T. Malcolm, Dunmore Home Farm; Mr Jonathan Middleton, Clay of Allan; eie Hon. the Master of Polwarth, Humble House; Mr E. Hedley Smith, B.L., hittinghame; Sir Alan H. Seton Stenart of Touch, Bart.; Mr W. S. Ferguson, letstonhill; Mr R. Shirra Gibb, Boon; Mr R. W. B. Jardine, yr. of Castlemilk; Mr Alexander M. Gordon of Newton; Mr R. Sinclair Scott, Burnside; Sir Robert D. Moncreiffe of Moncreiffe, Bart.; Mr John Murray, Munnieson; Sir Archibald Buchan Hepburn of Smeaton, Bart.; Rev. John Gillespie, LL.D., Mouswald Manse. *Extraordinary Directors*—Mr John Edmond, Galamuir; Mr John M. Martin, Edinburgh; Mr Andrew Hutcheson, Beechwood; Mr John Wilson, Chapelhill; Sir Ralph Anstruther of Balcaskie, Bart.; Mr John Cran, Kirkton; Mr Robert Paterson, Hill of Drip. *Treasurer*—Sir James H. Gibson-Craig of Riccarton, Bart.

Auditor—Mr William Home Cook, C.A. *Chemist*—Dr A. P. Aitken. Mr Alexander M. Gordon of Newton occupied the chair.

The minutes of last meeting were approved and signed.

A letter was read from Mrs Lumsden of Balmedie acknowledging the vote of condolence passed at last meeting.

STIRLING SHOW.

The SECRETARY reported that the headquarters of the Society would be at the Golden Lion Hotel, Stirling, and that the refreshment booths in the Show had been let to Messrs Hay, Aberdeen; Wilson, Glasgow; Brodie, Dalkeith; White & Smith, Glasgow; and the Scottish Army and Navy Stores Company, Edinburgh. The arrangements for the parades and jumping would be as at Kelso in 1898.

On the motion of the CHAIRMAN, seconded by Sir JAMES GIBSON-CRAIG, Mr T. D. Gordon Duff was elected a member of the Board in room of the late Mr Lumsden.

HIGHER EDUCATION SCOTLAND BILL.

In terms of notice given, Dr GILLESPIE moved—“That the Directors welcome with gratification the introduction into the House of Lords by Lord Balfour of Burleigh of a bill for the better organisation and equipment of higher, general, and technical education in Scotland, and that a committee be appointed to consider the bill and report as to what amendments, if any, they think it desirable to have introduced upon the measure, particularly in so far as it relates to education in agriculture and allied interests.” In speaking to the motion, Dr Gillespie said he had taken the liberty of bringing the bill under the notice of the Directors. It was one of the most important bills that had been brought into Parliament for some time, on account of its effect on higher education in agriculture. It would appear, on the face of his motion, that it was not conceived in any spirit of hostility to the bill, but simply as a means of drawing attention to it at the proper time. On the whole, it was a statesmanlike measure; but it was of importance to them to look at it carefully and see its bearings on higher agricultural education. His remarks would fall under two heads—finance and administration. As they were all aware, the Residue Grant had hitherto been in the hands of the county councils, and they had been in the habit, of recent years at least, of giving grants out of it to agricultural institutions, such as the West of Scotland Agricultural College. That state of matters was proposed to be changed under the new bill. The county authorities were to have no power at all over that now. It was to be administered by the Scottish Education Department. Personally, he had no objection to this proposal; but it was of importance that those interested should look to it. There was, however, a second proposal under the head of finance which required very close consideration—*i.e.*, that county councils should raise money by means of rates for supporting central agricultural schools. There was this advantage in this proposal, that it admitted the necessity for doing something more than has been done for the support of these institutions; but the method proposed for raising the money was one which could scarcely be relied upon. It was desirable that whatever was got in augmentation of the Residue Grant should be something that could be relied upon. It was suggested that the Equivalent Grant, which amounted to £100,000, should be earmarked in lieu of the proposal in the bill that a rate should be levied. It was in the power of the County Council to employ that grant to reduce the rates, and some purpose would be served if it was enacted as was now proposed. It was, however, of great importance that this question of raising money by rates should be narrowly considered, and the Directors would do well to bring their minds to bear on it. The other proposal was gratifying in so far as it proved that the Government appreciated the importance of the subject. Under the second heading—that of administration—very important changes were contemplated. All the power was to be in the hands of the Scottish Education Department, and county committees were to be instituted to assist the Department in carrying on secondary schools. That was a very wise proposal in respect of county institutions, and the advisory committee would be a great advantage to the Department in the management of these; but it was equally advisable that there should be central bodies to assist in controlling agricultural education at the central agricultural institutions. He desired to make no reflections on the capability or goodwill of the Scottish Education Department. It was administering the present Education Bill with great judgment; but even supposing it were always to be so administered, he was not passing any censure on the Department by saying that they had no special knowledge of agriculture, and they had no special ability qualifying them to manage that branch of education. It was very desirable that there should be a central agricultural advisory committee to assist the Scottish Education Department, which

would have the control of the money in the long-run. It would not serve the purpose he had in view to create a general advisory committee, because agriculture being only one of many interests, its representatives in such a body would be in a very small minority indeed, and have little voice in the disposal of any question which came before such a miscellaneous body as would be set up. There was urgent reason, therefore, that this matter should be looked into, not with a view of embarrassing Lord Balfour of Bureleigh in carrying his bill, but with a view to making it as successful as possible.

The Earl of MORAY seconded the motion. He thought it was desirable that a committee specially connected with a Society such as the Highland should examine the bill and suggest any amendment.

Mr JOHN WILSON heartily endorsed all that Dr Gillespie had said, and thought they should express their gratitude to the doctor for bringing the subject under the notice of the Directors. He trusted that this was not the only bill before Parliament to which the Board would give attention.

Mr ANDREW HUTCHESON said that they had discussed the bill at a meeting of the Perth County Council, and Professor Ramsay, who was a great educational authority, considered that the bill proposed to place far too much power in the hands of the Department. He hoped that any advisory committee that might be formed should not simply be there to carry out the resolutions of the Department. There would be great difficulty in county councils imposing rates for technical education.

Dr Gillespie's motion was unanimously agreed to, and the following Committee was appointed—viz.: The Chairman, The Master of Polwarth, Sir John Gilmour, Bart., Sir James Gibson-Craig, Colonel R. F. Dudgeon, Dr Gillespie, Mr Jonathan Middleton, Mr Andrew Hutcheson, Sir Ralph Anstruther, the Secretary, Mr John M. Martin—the last Convener.

PORTRAIT OF PRINCE OF WALES (673).

A letter was read from Principal M'Call, presenting portrait of this celebrated horse, and intimating that Mr Sinclair Scott would hand it over in the name of the donors.

Mr SINCLAIR SCOTT said he had much pleasure in handing over the portrait of this wonderful horse, Prince of Wales (673), which was in the room. It was not necessary for him to recite the remarkable history of this animal and the part he had played in the development of the Clydesdale breed. His record was unequalled in the annals of the breed, and it was due to this horse to a large extent that the Clydesdale horse occupied the place which it did as the draught horse of the world. It was a fair representation of the animal at the time the portrait was taken, and he thought they would all agree that it was a portrait which had every right to hang on the walls in their gallery upstairs.

The CHAIRMAN, in the name of the Society, cordially accepted the portrait so happily presented by Mr Scott. It was a valuable picture of a historic horse, and he had no doubt Mr Macdonald would see that it was put in a favourable corner, where it would be seen by all. They were greatly indebted to Mr Scott for the happy manner in which he had made the presentation.

NEW VARIETIES OF GRAIN.

The Society's gold medal was unanimously awarded to Messrs Garton Brothers in recognition of their services to agriculture in raising new varieties of grain and grasses.

AGRICULTURAL CLASS IN EDINBURGH.

Official intimation of the awards of the Society's prizes to this class was read by the Secretary. It was agreed that this would be the last occasion on which these prizes would be given by the Society, as it had previously been decided that such prizes could not be given to similar institutions throughout Scotland.

DEPARTMENTAL COMMITTEE ON PRICES.

An official communication was read from the Board of Agriculture, intimating the appointment of a Departmental Committee to inquire into the collecting of agricultural statistics and prices in Scotland; and on the motion of Mr John M'Hutchen Dobbie it was unanimously agreed to offer this Committee the use of the Society's rooms for their sittings, and afford them every facility in the performance of their duties.

A further official communication was read regarding the outbreak of foot-and-

mouth disease in Argentine Republic, and the reports of the Board of Agriculture were submitted.

Mr Hutcheson and Dr Gillespie both emphasised the significance of this step as bearing on the importation of live cattle in any form.

NATIONAL DIPLOMA IN AGRICULTURE.

The SECRETARY intimated that fifty-three candidates had entered their names for the first examination to be shortly held at Leeds, and he was given authority to make whatever arrangements might be necessary in view of this large number.

AGRICULTURAL HOLDINGS BILL.

Mr W. S. FERGUSON gave notice of motion for next meeting expressing gratification at the introduction of this bill, and trusting that reasonable amendments might be made.

A meeting of the Committee on the Education (Scotland) Bill was held immediately after the meeting, when the following resolutions were agreed to :—

(1) That provision be made in the bill for the appointment of a central committee to advise and assist the Department in stimulating, unifying, and directing agricultural education throughout the country.

(2) That the funds required for agricultural education be provided otherwise than by an addition to the local rates.

MEETING OF DIRECTORS, 2ND MAY 1900.

Present.—*Ordinary Directors*—Mr John Speir, Newton Farm; Mr George Dun, Woodmill; Mr John M'Hutchen Dobbie, Campend; Colonel R. F. Dudgeon of Cargen; Mr Walter Elliot, Hollybush; Mr Alexander Cross of Knockdon; Mr W. T. Malcolm, Dunnmore; Mr John M'Caig, Challoch; Mr Jonathan Middleton, Clay of Allan; Mr E. Hedley Smith, B.L., Whittinghame; Mr William Clark, Netherlea Farm; Mr W. S. Ferguson, Pictstonhill; Mr R. Shirra Gibb, Boon; Mr Alexander M. Gordon of Newton; Sir Robert D. Moncreiffe of Moncreiffe, Bart.; Mr John Murray, Muunieston; Sir Archibald Buchan Hepburn of Smeaton, Bart.; Rev. John Gillespie, I.L.D.; Mr T. Gordon Duff of Drummur. *Extraordinary Directors*—Mr John J. Moubray of Naemoor; Mr Lockhart, Mains of Airies; Mr John M. Martin, Edinburgh; Mr Andrew Hutcheson, Beechwood; Mr John Wilson, Chapelhill; Mr George R. Glendinning, Hatton Mains; Mr John Crau, Kirkton; Mr Robert Paterson, Hill of Drip. *Hon. Secretary*—Sir John Gilmour, Bart. *Veterinary Adviser*—Principal Williams. Mr Gordon in the chair.

VOTES OF CONDOLENCE.

The CHAIRMAN referred in sympathetic terms to the escape of H.R.H. the Prince of Wales, late President of the Society, from assassination on the last day on which they had met. He had taken the liberty of telegraphing to H.R.H. in the name of the Society, congratulating him on his escape, a course which he hoped would meet with their approval; and he had pleasure on laying on the table the telegram which he had received from the Prince of Wales himself in reply. He had also to refer to a very sad event in the domestic history of one whom they greatly esteemed. As they probably had all noticed from the public print, their honorary treasurer, Sir James Gibson-Craig, had lost his eldest son through an attack of illness while serving his Queen and country. They all deeply sympathised with Sir James Gibson-Craig and his household in this sad bereavement, and he had to ask their approval of a vote of condolence, the terms of which Mr Macdonald would read.

Agreed.

STIRLING SHOW, 1900.

Attending members for the various classes were appointed.

An official communication from the council of the Shropshire Sheep-Breeders' Association was read, offering £10 as a first prize for a class of pens of five Shropshire shearing rams, on condition that the Society offered a second prize of £5 for the same class. The Secretary was instructed to thank the intending donors, but to

point out that all special prizes should be intimated before the end of February, and that they could not make an exception in this case. He trusted, however, that the notice would be sent in good time next year.

AGRICULTURAL HOLDINGS BILL.

Mr W. S. FERGUSON had given notice of the following motion : " That the Directors welcome with gratification the introduction into the House of Commons by the President of the Board of Agriculture of a bill for the improvement of the Holdings (Scotland) Act ; and that a committee be appointed to consider the bill and report as to what amendments, if any, they think it desirable to have introduced upon the measure." Mr Ferguson said that in placing this motion before the Board he considered that, as an agricultural society sent to represent agricultural interests from every part of Scotland, it was their duty to give an expression of opinion on a matter of this kind, and also to suggest any amendments they considered necessary. The voice of the Board of that Society would, he considered, be listened to more than that of any other body in Scotland, and in giving this notice he had no thought of raising any political question. At the same time, he had to acknowledge that he was not aware that such subjects had been carefully eschewed in the past ; he had to acknowledge that he did not fully recognise what was the composition of that Board. It was composed of an equal number of landlords and tenant farmers, and no doubt that was a question which in a manner might give rise to friction between the two, as was inevitable in connection with legislation which admitted of debatable matter as between the two parties. He understood that no such contentious matter had ever been before the Board, and therefore if it was the wish of the meeting he would withdraw his motion. He, however, thought it would be right to appoint a composite committee to regulate matters in such a way as to decide what questions it was proposed to bring before the Board. He would not like to be the one to disturb the harmony which had prevailed, and he would therefore ask liberty to withdraw his motion, and they could decide afterwards what had best be done.

Dr GILLESPIE had no objection whatever to Mr Ferguson withdrawing his motion, but he wished to point out with reference to the proposal that it was the first time for 106 years that such a question had been raised, and he was of opinion that they would only discover their difficulty when they tried to define the terms of a by-law or regulation such as Mr Ferguson seemed to have in view. They were getting on very well at present, and even Mr Ferguson, after a month's reflection, had arrived at a sober frame of mind on the subject. They all knew what he meant, and he was quite sure Mr Ferguson clearly understood how his remarks were to be interpreted. All of them had an opinion on the Agricultural Holdings Bill, but there was plenty of opportunities of expressing these apart from that Board.

Sir JOHN GILMOUR thought the simpler plan would be for Mr Ferguson to withdraw his present motion, and, if anything further was to be done, it could be discussed afterwards.

The motion was then by leave withdrawn.

DIFFERENT FORMS OF PLOUGHING.

In accordance with notice given, Mr JONATHAN MIDDLETON moved—" That a committee be appointed to consider and report as to the expediency of having a series of experiments conducted with the view of ascertaining the effects which the form of furrow turned over by the different kinds of ploughs exercises upon crops." The trial he suggested would not cost very much, and would be of great value to the farming community everywhere. If the Board felt with him in these suggestions he would ask them to form a committee to make preparations for carrying out the test in different localities throughout Scotland. It was quite well known that the same kind of ploughing would not do equally well in all parts of Scotland.

Mr WM. CLARK seconded the motion, which he considered a very important one, and which materially affected farmers' interests.

Agreed.

A Committee was then appointed as follows : Messrs Paterson, Marr, Clark, Gibb, Dobbie, Speir, Ferguson, McCaig, and Middleton, Convener. The Committee is to report to the November meeting.

VETERINARY SURGEONS' DIPLOMAS.

A letter was read from Mr John Howard, V.S., Manchester, a holder of the Society's diploma, against their supporting the Veterinary Surgeons' Amendment Bill.

Principal WILLIAMS, in making a statement on the subject, said he was sorry the

question had been raised by Mr Howard, who could quite easily have got a diploma from the Royal College on payment of one guinea. At the same time he wished to say he sympathised to some extent with the subject matter of Mr Howard's complaint. It was represented that there were something like 300 veterinary surgeons practising who did not possess diplomas. His opinion was that 30 would be nearer the mark. He did not think that the Society was well advised in petitioning in favour of the bill, which he regarded as totally unnecessary. It was resolved to take no action in the matter.

HIGHER EDUCATION BILL.

Minutes of Committee meetings held on 4th April and 2nd May were read by the Secretary. The minutes of the former meeting have already been published. The West of Scotland College of Agriculture, Edinburgh School of Rural Economy, and Aberdeen University (Agricultural Department) have all petitioned on the same lines as the Highland and Agricultural Society. The County Councils of Scotland Association have also done so since last meeting. It was necessary to arrange a meeting with Lord Balfour of Burleigh in order to have the attention of the Government directed to the amendments which they considered necessary. They therefore ask authority to arrange such an interview with the Secretary of Scotland.

Agreed.

EXAMINATION.

The SECRETARY submitted a report regarding the recent final examinations for the diploma of the Society in agriculture, which showed results very satisfactory. In regard to forestry, only one candidate had presented himself, and he had failed to pass.

It was remitted to the Council on Education to consider a proposal to hold the examination in forestry each alternate year, instead of annually as heretofore.

It was agreed to hold the general meeting on the same day as the meeting of Directors—namely, 5th June next,—the general meeting at two o'clock, and the Directors beforehand.

PRICES OF AGRICULTURAL PRODUCE.

Messrs J. M'Hutchen Dobbie and Andrew Hutcheson were appointed to give evidence before the Departmental Committee on Reports of Agricultural Prices.

MEETING OF DIRECTORS, 6TH JUNE 1900.

Present.—*Vice-Presidents*—The Earl of Moray, and Sir Robert Menzies of Menzies, Bart. *Ordinary Directors*.—Mr John Speir, Newton Farm; Mr David Wilson of Carbeth; Mr T. Gordon Duff of Drummur; Colonel R. F. Dudgeon of Cargen; Mr Walter Elliot, Hollybush; Mr Alexander Cross of Knockdon; Captain Clayhills Henderson of Invergowie, R.N.; Mr W. T. Malcolm, Dunmore; Mr John M'Caig, Challock; Mr Jonathan Middleton, Clay of Allan; Mr E. Hedley Smith, B.L., Whittinghame; Mr William Clark, Netherlea Farm; Mr W. S. Ferguson, Pictstonhill; Mr R. Shirra Gibb, Boon; Mr Alex. M. Gordon of Newton; Sir Robert D. Moncreiffe of Moncreiffe, Bart.; Rev. John Gillespie, LL.D., Mouswald Manse; Mr C. H. Scott Plummer of Sunderland Hall. *Extraordinary Directors*.—Mr John J. Moubray of Naemoor; Mr John Edmond, Galamuir; Mr William Ford, Fentonbarns; Mr John M. Martin, Edinburgh; Mr John Wilson, Chapelhill; Mr Robert Paterson, Hill of Drip. *Chemist*.—Dr P. Aitken. *Veterinary Surgeon*.—Principal Williams, F.R.C.V.S. Mr Alexander M. Gordon of Newton in the chair.

THE WAR.

The CHAIRMAN, before beginning the ordinary business of the meeting, referred to the joyful news which had reached this country yesterday, and which had brought joy and satisfaction to all parts, and as far as he could observe on his travels down every town bore evidence of universal rejoicings. He had great pleasure, in their name, in congratulating all concerned on the happy issue of the efforts of the army in South Africa.

The minutes of the previous meeting were held as read and approved of.

STIRLING SHOW, 1900.

A letter was read from the Joint County Clerk of Perthshire, forwarding a contribution of £84, 8s. 5d., collected by voluntary assessment in the county of Perthshire.

ABERDEEN SHOW, 1902.

Letters were read from the Town Clerk of Aberdeen intimating that the Aberdeen Town Council had resolved to give the Society a free site on the Links and a free supply of water on the same conditions as on former occasions, together with a contribution of £100 to the Local Fund.

Letters were read from the County Clerk of Forfarshire stating that in aid of the Show his County Council had agreed to levy a voluntary assessment of £300 on proprietors in the eastern division of the county.

The thanks of the Directors were directed to be conveyed to the Town Council of Aberdeen and the Forfar County Council.

AGRICULTURAL SEEDS.

Intimation was received from the Board of Agriculture of the appointment of a Departmental Committee to inquire into the conditions under which agricultural seeds are at present sold, and to report whether any further measures can with advantage be taken to secure the maintenance of adequate standards of purity and germinating power.

Letters were read from the Secretary of above Departmental Committee regarding the nomination of witnesses to give evidence before the Committee.

In connection with these the Secretary said he did not know whether it was intended that the Committee should sit in Scotland and take evidence; but he presumed he would be permitted to offer, in the name of the Society, the use of the Society's rooms for the purposes of the Committee.

This was agreed to.

Regarding the suggested nomination of witnesses, Mr Macdonald referred to a full report on the subject which had been drawn up by Professor M'Alpine for the Society, and he proposed to place that in the hands of the Committee. It was agreed to ask Mr Hugh Lindsay, Mr M'Hutchon Dobbie, and Mr Speir to give evidence on behalf of the Society.

BILLS BEFORE PARLIAMENT.

Mr W. S. FERGUSON moved—"That it be remitted to a committee to prepare and submit to a future meeting of the Board a Standing Order regulating the practice of the Board of Directors in considering bills before Parliament." He did not desire to say anything in support of the motion, as it spoke for itself.

Mr DAVID WILSON seconded the motion.

Mr JOHN M. MARTIN moved the previous question. They had got on very pleasantly in the past without any such Standing Order, and he thought there was no reason for making any change such as was proposed by Mr Ferguson.

Sir ROBERT MENZIES seconded Mr Martin's motion, and on a division being taken it was found there were 12 for Mr Martin's motion and 6 for Mr Ferguson's, and the motion to appoint a Committee was therefore lost.

VETERINARY SURGEONS BILL.

A letter was read from the secretary of the Royal College of Veterinary Surgeons asking the Society to use its influence in urging the Government to afford facilities for passing the Veterinary Surgeons Amendment Bill in the present session.

Principal WILLIAMS said that he did not think it was necessary for the Society to do anything further on the subject than they had done. The number of men whom this affected was very small, and in a very short time none of them would be in existence. The bill, in his opinion, was not required at all, and he thought the Society would be consulting its own dignity by passing from the matter.

No action was taken.

NATIONAL DIPLOMA IN AGRICULTURE.

The SECRETARY read the formal report of the recent examinations at Leeds for the National Diploma in Agriculture.

FINANCE.

It was reported that the Secretary had recovered for the Society the sum of £291, 13s. 11d., being the amount of income-tax paid on this Society's revenue from its invested funds for the three years to December 1899.

THE SOCIETY'S SEAL.

The SECRETARY was authorised to attach the seal of the Society to such documents as required the stamp of the seal.

FORESTRY EXAMINATION.

The SECRETARY intimated that the next examination would be held on April 1901, and that the Council on Education recommended that this examination be thereafter held every second year.

Sir ROBERT MENZIES was of opinion that it was a great mistake to have examinations every two years only; but he would not oppose the proposition at this stage, as no doubt by April next year when the next examination was held the Directors would possibly have got more sense than to follow out the present resolution.

MEETING OF DIRECTORS, 7TH NOVEMBER 1900.

Present.—*Ordinary Directors*—Captain Clayhills Henderson of Invergowrie, R.N.; Mr W. T. Malcolm, Dunmore Home Farm; Mr William Duthie, Tarves; Mr John M'Caig, Challock; Mr Jonathan Middleton, Clay of Allan; Mr E. Hedley Smith, B.L., Whittinghame; Mr William Clark, Netherlea Farm; Mr W. S. Ferguson, Pictstonhill; Mr R. Shirra Gibb, Boon; Mr Alexander M. Gordon of Newton; Mr R. Sinclair Scott, Burnside; Mr John Murray, Munnieston; Mr John Marr, Cairnbrogie; Rev. John Gillespie, L.L.D., Mouswald Manse; Mr C. M. Cameron, Balnakeyle; Mr C. H. Scott Plummer of Sunderland Hall; Mr William Taylor, Park Mains; Mr F. W. Christie, Dairsie Mains; Mr John M'Glutchen Dobbie, Campend; Mr Thomas Gordon Duff of Drummur; Mr John Wilson, Chapelhill; and the Master of Polwarth. *Extraordinary Directors*—Mr R. Trotter, Garguston; Mr J. Lyon Guild, Strowan; Mr John M. Martin, Edinburgh; Mr Andrew Hutcheson, Beechwood; Mr George R. Glendinning, Hatton Mains; Mr John Cran, Kirkton; Mr Walter Elliot, Hollybush; Mr Charles Howatson of Glenbuck; and Mr John Speir, Newton Farm. *Treasurer*—Sir James H. Gibson-Craig of Eccarton, Bart. *Chemist*—Dr A. P. Aitken.

On the motion of Mr W. S. FERGUSON, the Rev. Dr Gillespie occupied the chair at the outset. When the minutes of the previous meeting had been confirmed.

Dr GILLESPIE moved that Mr A. M. Gordon of Newton be re-elected Chairman of the Board of Directors for the ensuing year. He was sure that the proposal would give universal satisfaction.

Sir JAMES GIBSON-CRAIG seconded, and expressed the opinion that Mr Gordon's re-election would be approved of not only by each member of the Board, but also by every member of the Society. Mr Gordon had attended every meeting since his election last year, and he had no doubt he would continue to do so.

The motion was unanimously agreed to, and Mr Gordon took the chair.

The CHAIRMAN returned his most sincere thanks for the high honour paid him in re-electing him for a second time Chairman of the Board. He had had considerable difficulty in attending regularly, but was pleased to think that a kind Providence had enabled him to do so without a break since his election last year. He trusted this would continue so in the year to come, and he would endeavour to keep up his record in this respect. Mr Gordon proceeded to explain that he had taken it upon him at the conclusion of the Show at Stirling to send to her Majesty the Queen a specially bound copy of the Catalogue of exhibits there. It was within their knowledge that her Majesty had taken a very prominent place as a successful exhibitor. The presentation was made through her commissioner, Mr Forbes, at Balmoral, and the Secretary would now read a letter from Mr Forbes.

Mr MACDONALD read a letter, in which Mr Forbes conveyed to the Directors her Majesty's thanks for the souvenir of the Show and her Majesty's expression of gratification that the Show had been a success, as well as her pleasure at the success of her own exhibits.

DECEASED MEMBERS.

Minutes relative to the deaths during the vacation of Mr W. H. Maxwell of Munches; Mr Peter M'Lagan, Pumpherston; and Mr Robert Anderson, Lochdhu, were moved by the Chairman, and suitable reference to the services of the deceased

gentlemen to the Society was made. Copies of the Minutes were engrossed, and ordered to be sent to the representatives of the deceased.

Agreed.

STIRLING SHOW, 1900.

On behalf of the Finance Committee it was reported that the probable balance to the good on Stirling Show would be about £1000. The official list of awards were laid on the table and confirmed.

Correspondence was read which had passed between the Secretary and Mr Thomas Smith, Powrie, Dundee, relative to the Ballindalloch challenge cup for the best Aberdeen-Angus cow, which was awarded to her Majesty's cow "Princess Irene 6th" (22,586), on account of its having gained first prize in the cow class of the Aberdeen-Angus section. Mr Smith claimed that it should now be given to him for his second-prize cow "Stumpie 29th" (21,065), her Majesty's first-prize winner having failed to prove in calf, and being therefore disqualified for the class prize. In other words, Mr Smith claimed that the Ballindalloch cup should follow the class prize. In his correspondence the Secretary had explained to Mr Smith that hitherto it had not been usual for the calving regulation to apply in the matter of the challenge cup; but Mr Smith was not satisfied and requested that the correspondence be brought before the Board.

It was unanimously agreed that the course hitherto followed be adhered to, and that Mr Smith be informed that the award of the Ballindalloch cup is not subject to the calving regulation.

A letter was read from Mr Campbell, Kilberry, complaining that the award of a commended ticket for a yearling bull in the Highland class made to him did not appear in the official list. It was explained that although the leader of Mr Campbell's bull had received a commended ticket there was no mention of the award in the attending members' book nor in the judges' book, and therefore the resolution of the Board was that they must adhere to the official awards.

The Hon. Mrs Vernon wrote pointing out that Mr Galbraith's filly, which gained third prize in the Hackney Class 60, was incorrectly described in the catalogue. It was explained that there was no reason to doubt that the error of description was due to an inadvertence, and that the animal exhibited was the animal Mr Galbraith intended to exhibit. The Directors saw no necessity for taking further action in the matter.

Letters were received from three or four exhibitors expressing regret at their diso-bering orders in respect of non-appearance of their animals on parade.

Mr W. S. FERGUSON moved that these letters be accepted as sufficient apology at the present time, but urged that exhibitors should understand that they are bound to bring out their animals for the parade. The Society makes a contract with the public to enable them to see the animals, and are bound to keep it. It cannot be too strongly impressed on exhibitors that the Society expects to be upheld in this matter, and so keep faith with the public.

INVERNESS SHOW, 1901.

A variety of details in connection with this Show were disposed of. A donation of £20 was intimated from his Grace the Duke of Richmond and Gordon, and thanks returned. The headquarters of the Society are to be in the Station Hotel, Inverness. Messrs Cran, Trotter, and Guild, local Directors, were added to the Committee having charge of forage contracts.

Dr GILLESPIE referred specially in this connection to the services rendered to the Society by Mr David Buttar, Corston—an ideal steward of the forage department—whose services in this respect were beyond criticism or praise.

Some discussion took place regarding the arrangements for lodging. It was recommended as very desirable that the prices charged should be reasonable, and Mr Guild explained that the Town Council had the subject before them, and they meant to have a uniform arrangement, if that were at all possible.

The first draft of the prize-list for the Inverness Show was laid on the table. It was explained that it was substantially the same as at Stirling, with the exception that the total amount offered by the Society is £2358—£116 less than at Stirling Show, and £862 more than at Inverness in 1892. It was explained that the Show Committee have in contemplation the abolition of the classes for poultry, on which they have been in the habit of expending somewhere about £200. This is not proposed because there is any lack of interest in the poultry department, or any lack of appreciation of the necessity for improving that department, more especially on small farms and crofts, but the Show Committee have a feeling that the ends in view would be much better attained by a grant of money to local poultry shows than by holding a poultry show in the middle of July. They had not arrived at any final resolution, but raised the question then in order that it might be discussed before the January

meeting. The Show Committee hoped that through the medium of the agricultural press the views of poultry-breeders might be made known to them before that date.

A letter was read from Sir Robert Menzies suggesting that a committee of extensive sheep-farmers who are not tup-breeders should be appointed to report as to what date should be fixed for the clipping of Blackface sheep for exhibition at the Highland Show.

The Show Committee reported that, having regard to the decision at the general meeting in the Stirling Showyard in July, they had that day resolved that the regulation for the clipping of Blackface sheep for the Inverness Show should provide that all Blackface sheep should be clipped after 1st February 1901, and that before regulations for the Show of 1902 are prepared, the Directors consider whether steps should not be taken to have the whole question more fully and deliberately considered by the general body of the members of the Society than was practicable at Stirling.

The CHAIRMAN said they were bound to do something on the lines of the resolution passed at the Stirling meeting. The Directors could not go in the teeth of that resolution, and he moved the adoption of the recommendation.

Mr HOWATSON could not agree to the proposal, and he demurred to making Blackface tup-breeders the football of the Society. He suggested that the question should remain over till the general meeting in January.

The CHAIRMAN said they could not ignore the resolution of the showyard meeting, and the Directors were bound to do something in connection with it.

Mr HOWATSON said that a former resolution had been set aside on very short notice some years ago, and he did not see why they could not do so again.

Mr MARR pointed out that in that case it was a resolution of the Directors which was overturned by a resolution of the general meeting, and he did not see that any one was going to suffer by changing the time of clipping one month.

Mr R. S. SCOTT supported the view taken by Mr Howatson. He demurred to the importance attached to the resolution of the showyard meeting. There were no steps taken to know the composition of that meeting. It was held in the open, and no one knew who was present. The resolution of the Show Committee, which had now been placed before them, would not meet the case at all. It did not meet the views of the members of the Society who supported the resolution, and it certainly did not meet the views of the exhibitors of Blackface sheep at the Highland Show. It was much better to leave the matter over until it had been fully discussed, and in the meantime to adhere to the existing regulations. The great body of exhibitors at the Highland Show had their sheep in preparation for another object later on, and any alteration the Society might make in this respect would simply militate against its own interests. Indeed, it would almost amount to the abolition of the Blackface classes at their Show. If the matter were left alone to the January meeting they might have a repetition of what took place in former years in connection with the Kilmarnock Dairy School.

Mr DUTHIE asked that the exact terms of the showyard resolution should be read.

The CHAIRMAN read the terms, from which it was plainly indicated that the date, 1st January, is much too early, and ought to be altered. He considered it was not consistent to move any resolution on the lines indicated—*i.e.*, that the existing rules should be adhered to.

Mr JOHN M. MARTIN was in entire sympathy with Mr Howatson and Mr Scott, but the proper time to have taken exception to the vote was at Stirling, and he had no doubt that if it had been done then it would have shown the absurdity of the position taken up, and finished the motion for the time being. He referred with sincere regret to the absence of Sir Robert Menzies from the meeting of Directors, and was sure it had not been the desire of the Selecting Committee or of the Directors that Sir Robert should not be present. With regard to the circumstances under which this question was raised two years ago, he thought it decidedly unfair that in questions of this kind those who knew most about them should be precluded from having a say in their decision.

Mr GORDON DUFF demurred to the question being discussed simply with reference to the exhibitors of Blackface tups. He thought the main question before the Directors was what was best for the interests of the Blackface breed of sheep throughout Scotland.

Mr GIBB objected to the attempt at compromise suggested by the Show Committee. He would like to try and meet the views of Sir Robert Menzies's party in some other way.

Mr HOWATSON moved that the date should be the 3rd January, which would be a little later than the 1st.

Mr MARR seconded.

Mr GIBB moved that the matter be delayed for a month.

Mr JONATHAN MIDDLETON and Mr SCOTT PLUMMER both seconded.

Mr DUTHIE said for the Show Committee that it recognised the difficulty of the

situation. In the resolution they had arranged, while adhering to the instructions given by the general meeting at Stirling, to make as little alteration on the existing condition of things as possible. They were bound by the vote of a general meeting to do something, and he was strongly in favour of supporting the Chairman's ruling.

The Rev. Dr GILLESPIE said he was not a Blackface man. He was not an authority on Blackface sheep, and he must take guidance on that matter from those who did know something about them. He was in favour of delay.

Sir JAMES GIBSON-CRAIG urged the constitutional question, and appealed to the representatives of Blackface breeders there present to submit to the very moderate proposal made by the Show Committee. It would be most unfortunate to put the Board into opposition to the general meeting of members.

Mr W. S. FERGUSON did not think it could be a very great hardship for the breeders or exhibitors to give in for once. It would be an experiment to try clipping one month later—a thing they had not been in the habit of trying for some time past. The best thing for them to do was to uphold the recommendation of the Show Committee.

Ultimately all other motions were withdrawn, and the Show Committee's recommendation agreed to.

A letter was read from Mr Charles Duncan, Meikle Kilmory, Rothesay, regarding the regulations requiring Ayrshire cows to be milked dry by a certain hour the night before the opening of the Show. On the recommendation of the Show Committee it was unanimously agreed that these regulations be deleted.

The following list of special prizes was announced :—

1. Donald Cameron, Esq. of Lochiel, President of the Society—Champion medal for the best animal or pen in each of the sections of live stock, as at Stirling.

2. Sir John Gilmour of Montrave, Bart.—£25 in prizes for yearlings by Thoroughbred stallions, as at Stirling.

3. Captain Clayhills Henderson of Invergowrie, R.N.—£27 in prizes for Hunter brood mares with foal at foot or to foal this season, as at Stirling.

4. Hunters' Improvement Society—Gold medal, value £10, 10s., for the best Hunter filly foaled in the year 1898, 1899, or 1900.

5. Hackney Horse Society—Gold medal, value £10, for the best mare or filly in the Hackney or Pony classes, provided the prizes offered in these classes amount to £150.

6. Sir Robert Menzies, Bart.—£18 in prizes for wool, as follows : (a) Blackface wether wool, five fleeces, £3, £2, and £1 ; (b) Blackface ewe wool, five fleeces, £3, £2, and £1 ; (c) Blackface ewe or wether hogg wool, five fleeces, £3, £2, and £1—all fleeces to be white, unwashed, and shown from sheep bred and reared on, or regular stock of, the exhibitor's farm.

7. Polled Cattle Society—Gold medal for the best breeding animal of the Aberdeen-Angus breed in the showyard.

8. By breeders of half-bred sheep—£10 in prizes of £5 for best male animal, and £5 for best female animal in half-bred sheep classes.

9. Suffolk Sheep Society—£20 in prizes for Suffolk ewe lambs and Suffolk cross lambs, as at Stirling.

10. J. D. Fletcher of Roscaugh—£10, 10s. for best team of Shetland ponies.

In connection with this it was agreed, on the suggestion of Mr Howatson, that the fleeces entered for Sir Robert Menzies's wool prizes should be weighed, and the weight of each attached for the information of the public.

ABERDEEN SHOW, 1902.

Letters announcing voluntary assessments of £500 from Aberdeen and £150 from Banffshire were read from the County Clerks of Aberdeenshire and Banffshire respectively.

FORMS OF PLOUGHING.

The Committee reported that they held a meeting on 6th June, when it was resolved that the ploughing trials should take place on lea ground alone.

SCIENCE.

The minutes of the Science Committee were read and approved of.

Some discussion took place on the report regarding a disease among swedes, to which the attention of the Board was directed by Mr James Biggar. The Secretary instructed Dr R. S. MacDougall to investigate and report.

BRAXY IN SHEEP.

An important communication was received from Professor Hamilton, Aberdeen, who has for three or four years been carrying out investigations into the cause of braxy in sheep. Professor Hamilton's work is full of interest, and the Secretary said, as far as he could judge, it was valuable alike from a practical and a scientific point of view. Most of the work had to be conducted on the hillside, and expenses were heavy; Professor Hamilton desired the co-operation of the Society, and financial assistance if possible.

Mr R. SINCLAIR SCOTT asked that the request be favourably considered. The disease was very prevalent in the west of Scotland and all over the country, and it would be a great benefit if success should attend investigations such as Professor Hamilton was conducting. He moved that the Directors regard with much interest the investigation carried on by the Professor, and also that the Society assist and encourage him in his work in every possible way.

A remit was made to the Science Committee to consider the matter and report to next meeting.

STRAY DOGS.

Mr DAVID BEATH communicated with the Board, asking the Directors to take into consideration the injury stock-owners are suffering from stray dogs.

On the motion of the CHAIRMAN the Secretary was instructed to say that they were aware of the importance of the subject, and would gladly support any well-considered means for putting an end to such ravages.

NATIONAL DIPLOMA IN AGRICULTURE.

The arrangements for the examination in 1901 were intimated, the examination to take place at the Yorkshire College, Leeds, on Monday, 6th May, and the four succeeding days. It was agreed that the expenses of the first examination, amounting to £301, should be defrayed in equal proportions by the two national Societies.

NATIONAL DIPLOMA IN DAIRYING.

The report was given in with regard to the National Diploma in Dairying and arrangements announced for the examination of 1901, which will take place at Reading in the last week of September, and Kilmarnock in the first week of October.

MEETING OF DIRECTORS, 5TH DECEMBER 1900.

Present.—*Ordinary Directors*—Messrs Alex. Cross of Knockdon; W. T. Malcolm, Dunmore Home Farm; Wm. Duthie, Tarves; John McCaig, Challoch; Jonathan Middleton, Clay of Allan; E. Hedley Smith, B.L., Whittinghame; Sir Alan H. Seton Stuart of Touch, Bart.; Messrs W. S. Ferguson, Pictstonhill; R. Shura Gibb, Boon; Alex. M. Gordon of Newton; Sir Robert D. Moncreiffe of Moncreiffe, Bart.; Messrs John Murray, Munnieston; John Mair, Cairubrogie; Rev. John Gillespie, LL.D., Mouswald Manse; Messrs C. M. Cameron, Balnakyle; Wm. Taylor, Park Mains; F. W. Christie, Dairsie Mains; David Wilson of Carbeth; John M'Hutchen Dobbie, Campend; Thomas Gordon Duff of Drummuir; Robert F. Dudgeon of Cargen; and John Wilson, Chapelhill. *Extraordinary Directors*—Messrs George Inglis of Newmore; G. R. Mackessack of Ardgrye; R. Trotter, Garguston; Andrew Hutcheson, Beechwood; John Cran, Kirkton; Robert Paterson, Hill of Drip; and Walter Elliot, Hollybush. *Treasurer*—Sir James H. Gibson-Craig of Riccarton, Bart. *Hon. Secretary*—Sir John Gilmour of Montrave, Bart. *Auditor*—Mr Wm. Home Cook, C.A. Mr Alex. M. Gordon of Newton in the chair.

VOTES OF CONDOLENCE.

The CHAIRMAN referred in sympathetic terms to the deaths of Mr Scott Skirving, Mr Donald Fisher, late of Jellyholm, and Principal Williams. Appropriate minutes were passed in each case.

LIEUTENANT HARRY GILMOUR.

The CHAIRMAN said there was another matter to which he was sure they would wish him to refer. They were all delighted to congratulate their good friend Sir John Gilmour on the recovery of his son (Lieutenant Harry Gilmour) from the very severe wounds received in his country's defence. They trusted he might soon arrive home, and when he did they would all rejoice to find, he hoped, that his severe trial had not incapacitated him from rendering his country still further service.

Sir JOHN GILMOUR expressed his own and Lady Gilmour's gratitude for the very kind sympathy so unexpectedly expressed by the Chairman, and all the sympathy received by them during their recent trying experience. He was glad to tell them that they had just received a letter from Pretoria, the first written by their boy since his recovery, and it was as clear and coherent as one could wish for. This was a most gratifying circumstance in view of the very severe wounds which he had sustained in the head. These words of the Chairman were very dear to him, and he desired to thank him and them.

GENERAL BUSINESS.

The general meeting was appointed to be held on Wednesday, 9th January, at 2 P.M., and the meeting of the Board at 12.30 P.M. on the same day.

Mr Howatson of Glenbuck having resigned his seat at the Board to enable Sir Robert Menzies, Bart., to be re-elected, the resignation of Mr Howatson was accepted, and the Chairman moved in accordance with the by-laws that the Board recommend the general meeting in January to appoint Sir Robert Menzies to fill the vacancy.

INVERNESS SHOW, 1901.

It was decided that the dates for closing entries for the Inverness Show be the same as for the Stirling Show of 1900. A proposal to allow entries to be withdrawn and others substituted up to within ten days of the Show was, on the recommendation of the Show Committee, negatived. The use of sawdust as bedding in the showyard is strictly prohibited. This is done in deference to the demands of the local authorities, who find it difficult to clean the ground after sawdust bedding is used. Coals must not be used at any time in the yard, but only coke.

The classes and prizes for Shorthorns, Aberdeen-Angus, Galloways, and Highlanders are to be the same as at Stirling last year. The Ayrshire cow class in milk is to be open to animals calved after 30th January 1898. This will admit two-year-olds in milk to compete. Prizes for fat cattle are introduced at the request of the Local Committee. Draught horses are to be as at Stirling—the classes for made Hunters are to be deleted. Hackney and pony classes are to be as at Stirling. Mr Fletcher of Rosehaugh gives £10 for the best team of four Shetland ponies. Jumping and driving classes will be as at Stirling. Regarding the sheep classes, they are to be as at Stirling, only that the classes for shearing widders are dropped. The Show Committee reported that they desire to treat the question of the poultry classes in as broad a spirit as possible. They had no desire to curtail the expenditure on this department, but they were anxious to get the best value for their money. They asked that the following special committee be appointed to investigate the whole question and report—viz.: Mr Martin, The Master of Polwarth, Mr Marr, Mr Duthie, Mr Hedley Smith, Dr David Wilson, Mr Hutcheson, Mr John Wilson, Mr R. Sinclair Scott, Mr C. M. Cameron, and Mr Martin, Convener.

It was agreed to acquiesce in a suggestion from Sir Robert Menzies that the fleeces of wool should not be weighed until after they are judged.

Contributions to the Local Fund were announced—from the Earl of Moray, £20; Sir Wm. Gordon Cumming, Bart., £20; and Lord Tweedmouth, £25.

Mr MACKESSACK of Ardgry mentioned that a Local Fund would be raised in Morayshire in lieu of the voluntary assessment which the County Council had declined to impose.

Mr GEORGE INGLIS of Newmore, on behalf of himself and other local breeders, intimated a special prize of £20 in the Shorthorn classes. It was decided to offer the prize for the best Shorthorn of either sex in the Show.

AWARDS FOR IMPLEMENTS.

Mr JONATHAN MIDDLETON moved—"That a committee be appointed to consider and report as to what steps, if any, might be taken by the Society with the object of encouraging the introduction of improved labour-saving machines and other appliances for use in agriculture, and in particular as to whether premiums of money or

medals might advantageously be offered by the Society for new or improved machines or implements exhibited in the Society's annual Show." He had put down this motion because he did not think they did enough for implement-makers. They had done a great deal for the farmers and they would need to do much more, otherwise he did not know how in many places the work of the farm was to be done. As one of the stewards of the implement department for several years, he had felt a difficulty, having had no prize or medal of any kind to give the exhibitors there. If wisely gone about a prize or diploma would be a great stimulus to implement-makers in bringing forward any new or improved piece of machinery. It would be an inducement to them to do their best in the future.

Mr MARR seconded.

Dr GILLESPIE did not intend to move any amendment, but as one who had long been a member of the Board he wished to say that the present practice of giving no diploma or award in the implement section was adopted at the request of the makers themselves. After a checkered existence the award system came to an end. They must not be rash in anything that was done in this direction; it was easy to make a mistake and give a fictitious value to some piece of machinery in which there was no special merit. In justice to the Society he felt that it was proper to state that it was at the implement-makers' own request that the present plan was adopted.

Mr INGLIS also uttered a word of caution. A great many new implements had been found wanting. Careful and accurate trials would be necessary before any award of that Society's medal was made.

The motion was then agreed to, and the following Committee appointed: Mr Middleton, Convener, Mr Trotter, Mr Marr, Mr Ferguson, Mr Paterson, Mr Glen-dinning, Mr M'Hutchon Dobbie, Mr Walter Elliot, Mr Wilson, Mr Speir, Mr M'Caig—the Committee to report to the February meeting.

IMPLEMENT DEPARTMENT AT THE SOCIETY'S ANNUAL SHOW.

The Secretary submitted the following report of the Special Committee appointed at the June meeting of the Board:—

"The Committee have had under consideration the remit from the Board of Directors of date 6th June 1900, to consider and report as to the expediency of steps being taken to limit the area of ground allotted to the implement department of the Society's Annual Show.

"By the exclusion of former first-prize winners, and by other regulations, the Society has to some extent restricted the exhibition of live stock, but it has not hitherto placed any limit upon the display in the implement section of the Show. In view, however, of the steady growth in the demands for space in the implement section, and especially of the fact that much of this space is used for the exhibition of 'duplicates,' and in view also of the increasing difficulty in obtaining suitable sites for the showyard in particular sites sufficiently close to large centres of population—it has come to be felt that, with advantage alike to exhibitors of implements and to the other interests involved, the extent of space devoted to the implement section might be made subject to moderate limitation. The Committee have most carefully considered the question in all its bearings, and they have come to the unanimous opinion that it is desirable to take steps in this direction.

"For the accomplishment of the object in view, three alternative courses have been suggested, viz.:—

1. Prohibit the exhibition of 'duplicates.'

2. Impose a limit to the maximum extent of ground given to any one exhibitor, and slightly increase the charge for space.

3. Substantially increase the charge for space, but impose no other restriction.

"There is something to be said in favour of the proposal to prohibit the exhibition of 'duplicates,' for the raising of the question at this time is no doubt mainly due to the great extent to which the exhibition of 'duplicates' prevails. The Committee however, are of opinion that it would be undesirable to rigidly prevent the showing of 'duplicates.' Such a course, they think, would be liable to give the commission agent a position of undue prominence in the showyard as compared to that of the manufacturer, and might, moreover, tend to retard the sale of implements and machines.

"The Committee recognise that the implement department of the Show serves a most useful purpose by affording agriculturists an opportunity of seeing and purchasing improved labour-saving machines and implements. It is felt, however, that this most worthy object is hindered rather than helped by the great dimensions to which the implement section of the Show has grown, visitors finding it impossible for them, in the limited time at their disposal, to inspect carefully the vast display of exhibits now to be found in this part of the Show.

"Moreover, if the space required for implements were considerably less in extent than it has become, it would be possible for the Society to arrange the showyard so that the live stock and implement sections would be brought into closer contact with each other, thereby promoting business in the implement section by making it easier for visitors to circulate freely through that part of the yard during the progress of the Show.

"The Committee consider that the second course mentioned above would best serve the end in view, and they would express the hope that exhibitors of implements will see it to be to their own interests to select and arrange their exhibits so that less space will suffice, thereby securing for themselves without any increase in cost—perhaps even with a reduction in cost—the advantages that would undoubtedly be derived from such a curtailment in the extent of the implement section as would permit of all parts of it being made easily accessible to visitors. The Committee accordingly recommend as follows, viz. :—

"1. That the maximum extent of space allowed to any one exhibitor be 50 feet of frontage in the motion yard, and 100 feet of frontage in other parts of the showyard.

"2. That the charges for space in the motion yard, and for open space in rest of the showyard, remain as at present; and that the charge for ordinary shedding be raised from 25s. to 35s. per 10 feet of frontage for members of the Society, and from 35s. to 45s. for non-members.

"3. That in the event of more space being applied for at any Show than can be satisfactorily set apart for this purpose, the Society reserve the power to allot to each exhibitor less space than that applied for.

"4. That these alterations come into force at the Aberdeen Show of 1902."

It was resolved to defer consideration of this matter till the February meeting of the Board.

BRAXY.

A minute of the Science Committee bore that the matter of Professor Hamilton's investigations as to braxy had been before them, and regarding these investigations with much interest, the Committee recommend that the Society should encourage and assist the Professor in prosecuting his work, that a vote of £50 be made to assist in defraying the costs of the work, and that a small sub-committee be appointed to co-operate with Professor Hamilton.

This was agreed to.

CLOVER SICKNESS.

The investigations being conducted into clover-sickness have so far been of a negative character, and the Committee asked that they be continued. Mr Scott Plummer was added to the Committee, and special thanks were given to Mr Somervail of Broomdykes for services in connection with the inquiry.

BOXING THE SEED OF LATE POTATOES.

On the suggestion of Mr Speir, it was resolved to carry out experiments to ascertain whether any advantage would be gained by boxing the seed of late varieties of potatoes, as is done with early varieties.

PUBLICATIONS COMMITTEE.

This Committee reported that the essays given in this year in competition for Mr Gillies's prize of £10 for the best essay on "Cabbage as a farm crop" were three in number, but were again declared by the jurors to be unworthy of the prize or of publication in the 'Transactions.' In the circumstances the Committee recommend that the Society take no further action in the matter.

Approved.

DISTRICT SHOWS.

A report was submitted showing that 270 districts had received grants during the past year. The total grants for 1901 amount to £464, 13s. 5d. as against £265 in 1893, and £320 in 1896.

The Board then sat in private for the election of judges for the Inverness Show of 1901.

MEETING OF DIRECTORS, 9TH JANUARY 1901.

Present.—Ordinary Directors—Mr Alexander Cross of Knockdon; Mr W. T. Malcolm, Dunmore Home Farm; Mr Jonathan Middleton, Clay of Allan; The Hon. the Master of Polwarth, Humber House; Mr E. Hedley Smith, B.L., Whittinghame; Mr William Clark, Netherlea; Sir Alan H. Seton Steuart of Touch, Bart.; Mr W. S. Ferguson, Pictstonhill; Mr Alexander M. Gordon of Newton; Mr John Murray, Munnieston; Sir Archibald Buchan Hepburn of Smeaton, Bart.; Mr C. M. Cameron, Balnakyle; Mr C. H. Scott Plummer of Sunderland Hall; Mr William Taylor, Park Mains; Mr F. W. Christie, Dairsie Mains; Mr David Wilson of Carbeth; Mr John M'Hutchen Dobbie, Campend; Mr Thomas Gordon Duff of Drummur; Mr John Macpherson Grant, yr. of Ballindalloch; Mr John Wilson, Chapelhill. *Extraordinary Directors*—Mr George Inglis of Newmore; Mr J. Lyon Guild, Strowan; Mr Andrew Hutcheson, Beechwood; Mr George R. Glendinning, Hatton Mains; Mr John Cran, Kirkton; Mr Walter Elliot, Hollybush; Mr John Speir, Newton Farm. *Treasurer*—Sir James H. Gibson-Craig of Riccarton, Bart. *Auditor*—Mr William Home Cook, C.A. Mr Alexander M. Gordon of Newton in the chair. The Secretary reported apologies for the absence of Sir Robert D. Moncreiffe of Moncreiffe, Bart.; Sir John Gilmour of Montrave, Bart.; Colonel R. F. Dudgeon of Cargen; Mr William Duthie, Tarves; Mr R. Shirra Gibb, Boon; Rev. Dr Gillespie, Mouswald Manse; Mr A. Mackenzie of Dalmore; Mr Donald M'Lean, Golspie; Mr John M. Martin, Edinburgh; Mr R. Paterson, Hill of Drip; Mr R. Sinclair Scott, Burnside; Mr R. Trotter, Garguston; Mr James Auldjo Jamieson, W.S.

Before proceeding to the ordinary business the Chairman wished all present the compliments of the season. He hoped the affairs of the Society would be in as flourishing a condition at the close of the century now begun as they were that day, as would be seen from the accounts now laid on the table.

FINANCE COMMITTEE.

The report of the Finance Committee for the year ending 30th November 1900 was laid on the table and adopted. The funded capital of the Society stands at £99,466, 18s. 1d. The balance of receipts over expenditure for the year was £2488, 8s. 8d. The profit on the Stirling Show was £1078.

INVERNESS SHOW, 1901.

The Shorthorn Society's £20 champion prize is to be offered for the best female of the breed. Mr Macpherson of Corrimony offers a prize of £10 for the best male or female animal in the Highland cattle section, and Mr Buttar and other breeders of Shropshire sheep offer 10 guineas in prizes for the best pens of cross-bred lambs got by a Shropshire tup. Thanks were recorded to each of these donors.

FORAGE.

The contract has been placed with Mr G. M. Howe, Castle Heather, Inverness, who has offered on the usual conditions.

POULTRY.

The Special Committee, having met and discussed very fully the question remitted to them by the Board as to the best way to utilise the sum expended on the poultry department, reported that, in their opinion, it would not be advisable to abolish the poultry section at the Society's Shows, and recommend that there be classes for poultry at the Inverness Show as heretofore, and that for future years the poultry schedule be revised, encouragement being for table poultry at the Shows of the Society or otherwise.

This report was adopted.

STEWARDS.

The stewards were appointed as formerly—namely: *Horses*—Mr W. S. Ferguson, Pictstonhill. *Cattle*—Rev. John Gillespie, LL.D. *Sheep and Swine*—Mr Walter Elliot, Hollybush. *Implements*—Mr Jonathan Middleton, Clay of Allan, Fearn, and Mr George R. Glendinning, Wilkieston. *Grand Stands*—Mr Andrew Hutcheson, Perth. *Forage*—Mr David Buttar, Corston. *Gates*—Mr J. M'Hutchen Dobbie, Campend, Dalkeith.

Mr DOBBIE wanted a second steward appointed for cattle and horses, but the Chairman thought sufficient unto the day is the evil thereof—the steward of horses looked hale and hearty.

HIGHLAND COWS.

The SECRETARY called attention to the request of the Highland Cattle Society that the regulation for the cow class in that section should read—"Cow of any age in milk and with calf at foot," instead of "or with calf at foot," as at present.

It was agreed that the regulation remain unchanged.

ABERDEEN SHOW, 1902.

A letter was read from the County Clerk of Kincardineshire intimating that the County Council had resolved not to impose a voluntary assessment in aid of the Show. It was remitted to the local representatives to take steps with the view of having subscriptions raised in Kincardineshire by private subscriptions.

SHOW OF 1903.

Sir JAMES GIBSON-CRAIG formally moved that, provided suitable financial and other arrangements can be made, the Show of 1903 be held in the Dumfries district. It was very desirable that they should begin early to think about this, as there was always difficulty in getting a site near Dumfries.

The resolution was seconded and unanimously agreed to.

GLASGOW HORTICULTURAL SOCIETY.

It was agreed, after discussion, to give a grant of six silver medals to this Society for its show to be held in connection with the Glasgow Exhibition of 1901.

FORESTRY.

The grant of £50 to the Forestry Lectureship in Edinburgh University was continued.

CLYDESDALE HORSES AT SHOWS.

Mr CLARK mentioned that owners of Clydesdale horses had been considerably troubled with an outbreak of cold or influenza amongst stock exhibited at Stirling, and they believed this had been contracted in the railway boxes coming home from the Show. The railway companies were legally bound to disinfect cattle-waggons, but they were not so careful about horse-boxes, and the number of foreign horses now being carried in these—many of which were affected with strangles and influenza—made it necessary that disinfection of boxes should be compulsory also. Many owners would not care to send their horses to Inverness Show after Stirling experiences, and he thought it was a subject which concerned the Society and the success of its Shows.

The CHAIRMAN complimented Mr Clark on his mode of bringing up the question, which he regarded as distinctly within the Society's view.

Mr MIDDLETON said the railway companies were bound to do this, and they should be asked to put the horse-boxes right. They were bound to keep them clean and disinfected. He moved that the Secretary communicate with the railway companies on the subject.

This was agreed to.

PROCEEDINGS AT GENERAL MEETINGS.

GENERAL MEETING, 6TH JUNE 1900.

The Right Hon. Lord BALFOUR of Burleigh, President of the Society, in the chair.

In moving the election of office-bearers, the CHAIRMAN said it gave him great pleasure, in view of the Show going to the north next year, to propose that Lochiel be appointed President. He was Convener of the county of Inverness, as well as Lord Lieutenant of that great county, and there was no more representative Highlander than Lochiel. It gave him great pleasure to place his name before the meeting.

Agreed.

OFFICE-BEARERS.

The other Office-Bearers were appointed as follows: *Vice-Presidents*—Lord Lovat, Beaufort Castle; Lord Tweedmouth, Guisachan; Sir Hector Munro of Foulis, Bart.; and Mr A. Mackintosh of Mackintosh. *Ordinary Directors*—Mr John M'Hutchen Dobbie, Camperd; Mr William Taylor, Park Mains; Mr David Wilson of Carbeth; Mr F. W. Christie, Dansie Mains; Mr John Wilson, Chapelhill; Colonel R. F. Dudgeon of Cargen; Mr Thomas Gordon Duff of Drumnair; Mr John Macpherson Grant, yr. of Ballindalloch. *Extraordinary Directors*—Provost William M'Bean, Inverness; Mr James E. B. Baillie of Dochfour, M.P.; Mr Andrew Mackenzie of Dalmore; Mr John Miller of Scrabster; Mr George Inglis of Newmore; Mr George R. Mackessack, yr. of Ardyce; Mr Donald M'Lean, Dunrobin; Mr John Ross, Meikle Tarrel; Mr R. Trotter, Garguston; Mr James L. Guild, Inverness; Mr John M. Martin, Edinburgh; Mr Andrew Hutcheson, Beechwood; Mr Welwood Maxwell of Kirkennan; Sir Ralph Anstruther of Balaskie, Bart.; Mr George R. Glendinning, Hatton Mains; Mr John Cran, Kirkton; Mr Robert Paterson, Hill of Drip; Mr Walter Elliot, Hollybush; Mr John Speir, Newton Farm; and Mr Charles Howatson of Glenbuck.

STIRLING SHOW, 1900.

Mr A. M. GORDON, in the absence of Sir James Gibson-Craig, to whose bereavement (through the death of his eldest son in South Africa) Mr Gordon referred in sympathetic terms, gave in the report regarding this Show, to be held in the King's Park, Stirling, on the 17th of July and three following days. He stated that the arrangements are well advanced, and that there was every prospect of a large and successful Show. An unusually large area of space has been applied for in the implement section of the Show, the extent of implement shedding being much in excess of that at the Stirling Show of 1891. A convenient and beautiful site has been obtained on the King's Park, and rapid progress is being made with the showyard erections. Entries of live stock, which are coming in satisfactorily, close on Monday the 11th inst. at the ordinary fees, and on the morning of Wednesday the 13th inst. at late fees.

INVERNESS SHOW, 1901.

In the absence of Mr John Macpherson Grant, Mr A. M. GORDON reported that the arrangements for that Show are progressing satisfactorily. A substantial local

fund is being raised, and no effort would be spared by the authorities of Inverness and the surrounding counties to promote the success of the Show.

ABERDEEN SHOW, 1902.

Mr A. M. GORDON reported that the arrangements are well advanced for holding the Show of 1902 at Aberdeen. The Town Council of Aberdeen had voted the sum of £100 towards the local fund, and had resolved to give a free site for the Show on the links, together with a free supply of water, as on former occasions. The County Council of Forfarshire had resolved to raise in aid of the Show a sum of £300 by means of a voluntary assessment on properties in the eastern division of the county. The other County Councils in the district had the matter of a voluntary assessment under consideration. Considering that the late Lord Provost of Aberdeen had mentioned that the last visit of the Society had brought £50,000 into the town, Mr Gordon could scarcely think that the donation of £100 from the funds of the town was a specially liberal grant.

AGRICULTURAL EDUCATION.

The Rev. Dr GILLESPIE submitted reports on the recent examinations in agriculture. The first of the joint examinations for the National Diploma in Agriculture, instituted by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland, took place at the Yorkshire College, Leeds, on Monday, 30th April, and four following days. This examination is divided into two sections, and is to be spread over two years, but in the first year students were allowed to enter for both sections. In all, thirty candidates entered for both divisions, and twenty-three for the first division alone. Of the fifty-three thus entered, fifty-one presented themselves in division 1, with the result that fourteen passed in all the five subjects. Of the thirty-seven unsuccessful students, eight failed to obtain pass marks in every one of the five subjects, eight in four subjects, nine in three subjects, seven in two subjects, and five in one subject. Of the fourteen who passed in division 1, only eight had entered for division 2. Of these eight, one failed, and the other seven passed and obtained the National Diploma in Agriculture. The regulations for the examination provide that students who obtain a certain high percentage of marks in all the subjects receive the diploma with honours, and that a gold medal is awarded to the student in the honours list who obtains the greatest number of marks. The gold medal was won by Mr George Potts of the Durham College of Science, the only student who earned honours marks in all the subjects. In view of the institution of the joint examination for the National Diploma in Agriculture, the Society's own examination in agriculture, which was carried on annually for over forty years, has been discontinued, a final examination having been held last April for the benefit of students who had not more than two subjects to pass for the Society's diploma. At that examination fifteen students presented themselves, and fourteen obtained the Society's diploma. The Society's first examination took place on 14th April 1858, when three candidates presented themselves, of whom one is reported to have passed a satisfactory examination and obtained the Society's diploma. The young man who won that, the first of the Society's diplomas in agriculture, is now the respected adviser of the Board of Agriculture—Sir Jacob Wilson. The last of the full examinations took place in April 1899, when thirty-one students entered, and nine obtained the diploma. In all, 195 candidates have obtained the Society's diploma in agriculture. He stated that the £10 given as prizes to students attending the class in agriculture in the University of Edinburgh was awarded as follows: William Bruce, Laurencekirk, £4; Samuel Simpson, Lancashire, and John Noble Jack, Ross-shire, £3 each. It was resolved by the Directors that, as the Society was not giving similar grants to any other class in agriculture, this vote of £10 be discontinued.

EDUCATION (SCOTLAND) BILL, 1900.

The Rev. Dr GILLESPIE moved—"That the members of the Highland and Agricultural Society of Scotland, in general meeting assembled, desire to express their gratification at the introduction into Parliament by Lord Balfour of Burleigh of a bill for the better organisation and equipment of higher, general, and technical education in Scotland; and while leaving to the Board of Directors the duty of taking whatever steps may be thought desirable for safeguarding and furthering the interests of education in agriculture, they gladly embrace this opportunity of conveying to Lord Balfour of Burleigh an expression of their high appreciation of the great services which his lordship, in bringing forward this measure, is conferring upon Scotland and Scotsmen." In speaking to his motion, Dr Gillespie said that there was very much in this important bill which had been received with a chorus of applause throughout the country. The Highland Society had for many years been the only body which

instituted examinations in agriculture. They were the pioneers of agricultural education throughout the country. In 1825 they instituted lectures in veterinary science, and no fewer than 1180 veterinary surgeons had taken their diploma. In 1856 they received their agricultural charter, and under it they had gone forward in the imparting of agricultural education. In 1868 the Society had voted an annual grant of £160 to the Chair of Agriculture in Edinburgh University, with the result that the Government had come forward and given a similar grant. Not only had they voted many prizes, but they had offered bursaries in connection with the promoting of agricultural education throughout the country. Not only had the Society fostered agricultural education during the past half-century, but they had spent a sum of £14,000 in that period on the promotion of that object. They were sometimes said to accumulate a deal of money, but these figures also showed that they had done something more—they had laid out the money to good advantage. Some of the changes which they suggested should be made in the bill were due to the fact that they could not always depend on having the office of Scottish secretary occupied as it was at the present time. They did not know who might be in charge of that office in the future. They might have one who not only did not know about agricultural education, but, what was worse, who did not know that he did not know. The bill, as a whole, was an admirable bill, especially as it recognised technical education in a fashion in which it had never been recognised in this country before, although there were certain things they would like to see improved.

Sir RALPH ANSTRUTHER of Balcaskie seconded the motion. He hoped one result of the bill would be to promote the bringing under the notice of the children of the country the great national industry of agriculture. The motion was unanimously agreed to.

The CHAIRMAN said he would like to express his thanks to the meeting and to Dr Gillespie for their kindness alike in what had been said regarding the bill and himself as its promoter and the present occupier of the position of Scottish secretary. He would have been very ungrateful indeed if he did not acknowledge what the Highland and Agricultural Society had done for agricultural education, and if he did not admire at the same time the representative character of that body. He was glad to think that Dr Gillespie recognised that the Scottish Education Department as presently constituted understood this question, and would do their best to carry out technical education in Scotland in accordance with the system which prevails here. He did not think for a moment that either the Society or the Department had got to the end of their labours in connection with this matter. They had to learn by experience, and might hope to do much more than they had yet done. He would say that personally he was not much in love with the idea of a Consultative Committee. Dr Gillespie had been good enough to say that at present education was under the control of those who had a knowledge of agriculture and of Scotland, but others might arise who had no knowledge of that subject. If that were so he hoped that they would come to the Highland and Agricultural Society, the West of Scotland Agricultural College or the Scottish Chamber of Agriculture, and learn. Personally he did not draw any distinction between technical education and agricultural education. The latter was simply technical education for the farmer. Technical education concerned more than one trade; agricultural education was simply technical education in connection with agriculture. He would be glad to give the best possible consideration to what would benefit agriculture in Scotland. He hoped to have an interview with the Committee of their Directors immediately after the meeting adjourned.

SCIENCE DEPARTMENT.

Mr SHIRRA GIBB reported that the sheep-feeding experiment which has been carried out during the winter by Mr William Hutcheson at Mains of Airleywight, Bankfoot, has been brought to a very successful conclusion. There were altogether seven lots of sheep of one score each, fed on turnips and hay, along with various feeding-stuffs. The differences between the various lots are not so great as in former experiments, but the results are not inferior in interest and value. The report of the butchers in London had not yet been received, and it will be some time before the whole details are able to be presented in a complete state. The experiments with basic-slag, applied to pastures both singly and in combination with other manures, is proceeding in widely different parts of the country, but the reports regarding them are not due till the end of summer. The report of the Sub-Committee appointed to inquire into the cause of clover-sickness on the farm of Mr Somervall, Broomdykes, has been received. The investigation has proceeded so far as to show that it is not caused by any deficiency in the manurial constituents of the soil; but further investigation is needed to determine whether one or more species of eel-worm, which were found in abundance on the roots of the clover, are the sole or only a contributory cause of the mischief, and what methods should be adopted for their destruction.

FORESTRY DEPARTMENT.

Sir ROBERT MENZIES reported that the forestry examination was held from the 10th to the 12th April, when only one candidate came forward, and he failed to satisfy the examiners.

It was remitted to the Council on Education to consider whether the examination in forestry should continue to be held annually, or only every second year. They recommend that the examination be held in April 1901, and thereafter every alternate year.

BOTANICAL REPORT.

Mr A. N. M'ALPINE, Botanist to the Society, reported that during the present season he had tested sixty samples of grass and clover seeds.

The following figures show the maximum and minimum percentages of purity and germinating power given by the samples tested :—

CLOVERS.	Purity, per cent.		Germination, per cent.	
	Max.	Min.	Max.	Min.
Red	100	94	100	91
Cowgrass	100	95	100	95
Alsike	100	86	96	26
White	100	86	95	70
Trefoil	100	97	100	94
GRASSES.				
Perennial ryegrass	100	95	99	86
Italian ryegrass	100	96	98	78
Meadow fescue	100	98	100	95
Timothy	100	97	100	94
Cocksfoot	99	95	95	70

The EARL OF MORAY moved a vote of thanks to the Chairman, after which the meeting dissolved.

GENERAL MEETING IN THE SHOWYARD AT STIRLING,
18TH JULY 1900.

Lord BALFOUR of Burleigh, President of the Society, in the chair. There was a large attendance of members.

VOTES OF THANKS.

The Rev. Dr GILLESPIE, Mouswald, proposed a vote of thanks to the Provost, Magistrates, and Town Council of Stirling for the aid they had afforded to the Society. Nowhere had the Society received more cordial assistance and support than they had experienced at the hands of the Corporation of Stirling. On this occasion the Town Council of the burgh had excelled themselves. They had given a contribution of £100 towards the funds of the Society, and they had also given a free and copious supply of excellent water, although at Stirling, as elsewhere, the local authorities never offered them anything to mix with the water. Since the Society had arranged to visit Stirling, Dr Gillespie added, the Town Council had been most courteous and helpful to them in many ways.

Mr GORDON DUFF of Drummur seconded the motion.

Provost FORREST, Stirling, acknowledged the vote of thanks, and said that he and his colleagues were glad to know that what they had done had been satisfactory to the Society. The local authorities had always given a supply of water on the occasion of a visit of the Society. On previous occasions they had not given so large a donation to the funds as they had this year, but at the same time they had willingly given the grant, and they were glad to know that it was so highly appreciated. He trusted that the Show would be a great success, and would be profitable to the Society.

Mr J. D. FLETCHER of Rosehaugh proposed a vote of thanks to the subscribers to

the funds in aid of the Show, and to the donors of special prizes. They were, he said, very much indebted to those gentlemen, especially to the donors of the special prizes, which added considerably to the interest of the competitions.

Sir ARCHIBALD BUCHAN-HERBURN of Smeaton seconded the motion, which was unanimously agreed to.

Mr JOHN WILSON, Chapelhill, moved a vote of thanks to Mr Wilson, Carbeth, and other members of the Local Committee for the assistance rendered by them in carrying out the Show and in promoting its success. They might, he said, look forward to that Show being a success, and they heartily thanked Mr Wilson and his Committee for the invaluable assistance they had given to the permanent officials in making the arrangements for the Show.

Mr A. HURCHESON, Beechwood, Perth, in seconding the motion, said that although nothing was said in the motion about their friend Mr James Macdonald, they were all very much indebted to him for the business-like way in which he managed all their Shows. Nothing impressed him more than the smoothness with which the judging went on the previous day, and he was sure they would join in saying that Mr Macdonald deserved the thanks of the Society for his services.

Mr DAVID WILSON, Carbeth, in the name of the Committee, thanked the meeting for the vote of thanks. It had been a great pleasure to the Local Committee to do anything they could to make the Show a success, and when the Society next visited Stirling and required their services, these would be very gladly rendered.

THE CLIPPING OF BLACKFACED TUPS.

Sir ROBERT MENZIES submitted the motion of which he had given notice as follows—"That the date at which the Highland and Agricultural Society permits the clipping of blackfaced tups for exhibition at its annual Show—namely, 1st January—is much too early, and should be altered." Nothing, he said, could be more unusual or unnatural than clipping blackfaced sheep before the 1st of January. The result was that they were starving and shivering all winter, and by the time the fleece was grown they were panting with heat. That was a most unnatural and improper thing, and there was no necessity for it. If the sheep were clipped at the proper time they would be in a much more healthy state than they were just now. He once bought a blackfaced tup with a very long coat. The tup had been always in the house instead of being out on the hill, where he ought to have been. The result was that he was perpetually coming into the house, and when the doors were shut upon him he went into the cart shed. They were determined to have it out with him, and so they put him outside along with the rest of the sheep; but when the shepherd went out next morning the tup was dead. That was the reason why blackfaced should be allowed their wool in winter, and should be deprived of their wool in summer. It was said that perhaps it affected the sale of the sheep at the autumn sales; but if the sheep were clipped either in May or June, by the time they came to be shown at the autumn sales purchasers could see exactly what the wool was like. He hoped the Society would recognise that he was endeavouring to keep the Society right when he thought they were wrong.

Sir ALEXANDER MUIR MACKENZIE of Delvine seconded the motion.

The CHAIRMAN said he had been asked to inform the meeting that in April last year two questions were sent out to exhibitors of blackfaced sheep. The first question was—"Should there or should there not be any regulations as to the clipping of blackfaced sheep to be shown in future Highland Shows?" And the second was—"In the event of your considering the continuance of the clipping regulations desirable, what date should be stated as that after which blackfaced sheep exhibits must be clipped?" These two questions were sent to all the exhibitors—30 in number—who had exhibited during the last ten years at the Show. Of these 17 answered the first question in the affirmative, and 16 of the 17 preferred the 1st of January in answering the second question. The 17th man proposed the 1st of February.

Sir ROBERT MENZIES said it was not exactly the condition of the Show sheep that was the important matter; it was the usefulness of the blackfaced breed all over Scotland that he aimed at. They should not have their policy dictated by sixteen gentlemen.

Mr JOHN CRAIG, Innergeldie, moved the previous question. The motion would receive a considerable amount of sympathy, because there was no doubt that sheep that required to be kept on the hill must be kept in as natural a condition as possible during the rest of the year; but whether Sir Robert Menzies took the proper course in asking the Society to alter their clipping regulations was a different matter. It must be borne in mind that there must be a certain amount of wool on a sheep before the judges were able to distinguish whether the fleece was of proper quality or not.

There was also the fact that if exhibitors had less time in which to bring out the sheep they would put on extra pressure, which would be hurtful to the animals.

Mr JOHN ARCHIBALD, Overshiels, seconded the amendment.

On a show of hands the motion was carried by 65 to 59 votes, and the subject was remitted to the Directors.

THE MILKING OF AYRSHIRE COWS.

Mr CHARLES DUNCAN, Little Kilmory, Bute, complained of the Society's regulations as to the milking of Ayrshire cows, which required that they should be milked at a prescribed time on the night before the Show. He contended that exhibitors of the breed should be allowed to milk their cows at the time they thought most proper and suitable. He claimed that Ayrshire cows were the best rent-paying cattle, and that the smallness of the present show of them was due to the regulations. With an alteration of these conditions they would get a much larger display. He moved that every man be allowed to do what he liked with his own.

The CHAIRMAN said he was afraid the motion was not one that it would be competent for him to put to the meeting. He suggested, however, that Mr Duncan should put his views on the subject in writing, and lay them before the Directors, who, he was sure, would give them full consideration.

The Rev. Dr GILLESPIE said that in a particular case, to which reference had been made by Mr Duncan, everything had been done in compliance with the regulations of the Society, under his own supervision and under that of Principal Williams, their veterinary inspector.

Mr ROBERT WILSON, Manswraes, Paisley, supported Mr Duncan's contention. He said the grievance was not a new one—Ayrshire breeders had suffered from it in former years—and if the regulations were not altered, they would have no exhibition of the breed at all at the Society's Show. Complaints in regard to the matter had been made on previous occasions to the Directors, and these had not been treated respectfully. Only a very few of the Board had any sympathy with the Ayrshire cattle men. He seconded the motion, which he understood to mean that a cow should be milked at the time the exhibitor thought best.

The CHAIRMAN repeated his suggestion that the members interested should lay their views before the Directors.

Mr DUNCAN agreed to this, and withdrew his motion accordingly.

LORD BALFOUR AND AGRICULTURAL EDUCATION.

Mr A. M. GORDON of Newton proposed a cordial vote of thanks to Lord Balfour of Burleigh for his services as President of the Society. He might fairly say of Lord Balfour that he was the first business man in Scotland. Certain he was that so long as his Lordship held his present position as Secretary for Scotland, every Scotsman might be sure that their interests would be thoroughly attended to.

The CHAIRMAN, in acknowledging the vote of thanks, said that when he heard that he was to be proposed for the office of President of the Society, he felt that one of the greatest honours that could be conferred on any Scotsman had been conferred on him. He had had a very pleasant year of office, and he could assure them that the remembrance of it would be among his most pleasant recollections. They would allow him to read a letter of apology from his friend and colleague, Mr Long, President of the Board of Agriculture, who wrote as follows: "I am sorry that I shall not be able to attend your Show this week. It is a great disappointment to me, and I hope you will be so good as to convey my regrets and apologies to the members. The cause is, of course, the state of Parliamentary business." He knew that Mr Long intended to be present at the Show. Three months ago Mr Long had promised to him that he would come if possible, and he knew that he would have fulfilled the promise had it been possible. Might he convey to the President of the Board of Agriculture an expression of deep regret on the part of the members at his absence, and the hope that he would be able to attend any future meeting of the Society? With reference to his year of office as President, he only wished to say that one notable step had been taken—a step which not only concerned the Society, but concerned him too, as Vice-President of the Scottish Education Department. He was glad to think that during the last year they had managed to get the adhesion of all the south-western counties to a joint scheme under which an agricultural college had been established at Kilmarnock on a very liberal and hopeful scale. The state of that institution reflected the greatest possible credit on the energy and the good sense of the agriculturists in the south-west of Scotland, and he hoped that the example which they had set would be followed in other parts of Scotland. If it were, he could assure the agriculturists that they would receive the most hearty support of the Scottish Education Department. They had given—might he say he had given?—out of a fund which came to them last year—a

sum of about £35,000, which they devoted to higher education—£2000 a-year, which was set apart as a grant under that Act for these agricultural institutions; and they distinctly contemplated that move as forming a part of the scheme of operations under the Education Bill which he introduced into Parliament this last session. That bill would, he hoped, become law in another session, and he believed it would do a great deal of good to agricultural education. They looked to such societies as the Highland and Agricultural Society to give them all the help they could, and he thought those who were interested in the management of the Society and others knew that after the meeting in the month of June with some friends of agricultural education, they arranged the details of a scheme which, if carried into effect, would effectually prevent it being hereafter said that agricultural opinion in Scotland was being neglected in this matter of agricultural education by the Education Department. Although the bill had not passed, that scheme remained binding upon both of them, and he hoped when the bill did pass, it would be carried into effect, and prove really successful.

The proceedings then came to a close.

ANNIVERSARY GENERAL MEETING, 9TH JANUARY 1901.

Mr A. M. GORDON of Newton presided. In introducing the business, he wished the company a Happy New Year. The close of the year and of the century found the Society in a very prosperous condition. It was the most successful show society during the past year, and while several of their neighbours in the south had made heavy losses on their shows, the Highland had made a large profit on the Show of 1900. He thought this was a notable tribute to Scotland as a stock-breeding country. It was indeed the stud-farm of the world, all nations coming to them for all kinds of stock. He, doubtless, expressed the general feeling when he hoped Scotland would, during the coming century, maintain her proud position as the pre eminent country in agricultural pursuits.

ELECTION OF MEMBERS.

New members to the number of 104 candidates were balloted for and elected.

The CHAIRMAN said he was sure they were all delighted to hear one name read out there—that of Colonel Anstruther Duncan of Naughton. They were pleased to find the husband of Miss Morrison-Duncan taking up the connection with the Society which had been so long maintained by the Naughton family.

OFFICE-BEARERS.

The SECRETARY stated that the Board of Directors recommended that Sir Robert Menzies, Bart., be elected an extraordinary director in room of Mr Howatson of Glenbuck, who had asked the Board to accept of his resignation so that Sir Robert might be re-elected to a seat at the Board.

The CHAIRMAN formally moved the election of Sir Robert Menzies. Through some lamentable oversight his name had been omitted, and as no one desired that the veteran should not hold his place, Mr Howatson, in the handsomest way, retired to make room for him. Sir Robert also kindly agreed to take his old place.

Agreed.

Sir ROBERT MENZIES accepted office, and cordially thanked Mr Howatson. He thought he could be of some service to the Board in connection with the Argyll Naval Fund and Forestry, in which he took a special interest. Some people would have taken the pet, but he did not.

FINANCE.

Sir JAMES GIBSON-CRAIG laid on the table the volume of the Society's Accounts for the year to 30th November 1900, as audited by the Society's auditor. The results of the past year were highly satisfactory financially, as in other respects. The total receipts for the year amounted to £13,161, and the expenditure to £10,672, leaving a balance of £2488. This large balance is to a great extent due to the unexpected financial success of the Stirling Show, which left a profit of over £1000. Another important factor is the continued large increase in the list of members, over 300 new members having been elected last year. The credit balance is further increased by the repayment of income tax for the three years to 31st December 1899 amounting to

£291. It was the first time on record that the Stirling Show had paid, and the Secretary was entitled to their congratulations on the result. The estimates for the ensuing year were also submitted.

ARGYLL NAVAL FUND.

Sir ROBERT MENZIES submitted the Accounts of the Argyll Naval Fund for 1899-1900, which showed that the income for the year amounted to £240, 0s. 5d., while the expenditure was £200, made up by a grant of £40 to each of the five naval cadets.

STIRLING SHOW, 1900.

Mr MALCOLM, Dunmore, for the Convener of the Local Committee, reported upon the Stirling Show of last year. The Show was favoured with delightfully fine weather, and in every respect it was highly successful. The attendance of the public was large, and the total drawings on the four days of the Show amounted to £4312, being £1382 more than at the Stirling Show of 1891, and £1735 more than in 1881. The net financial result was a credit balance of a little over £1000, as compared with a loss of £565 in 1891 and of £972 in 1881. The town of Stirling and the counties in the Stirling district contributed liberally to the funds, and had most cordially supported the Society in carrying out the Show. The display of live stock was large and of a high character. In the implement department there was an exceptionally large display, and it is pleasing to learn that business was unusually brisk in this section of the showyard. It was a good thing for the Stirling district that the Show had paid so well, as it ensured its return in future.

INVERNESS SHOW, 1901.

Mr JOHN MACPHERSON GRANT, Convener of the Local Committee, reported that satisfactory progress is being made with the arrangements for the Show to be held at Inverness on Tuesday the 16th of July and three following days. The town of Inverness will provide an excellent free site for the Show in the Town Park at Toninahurich, and had besides voted 50 guineas to the local fund. The Town Council of Inverness were in other directions co-operating heartily with the Society in promoting the success of the Show. The appeal made to the northern counties to raise a large local fund to aid in defraying the expenses of the Show has met with a most gratifying response, and it is hoped and believed that when it has been completed the local fund will be one of the largest ever raised in any part of the country. A very liberal prize-list has been arranged, and will be circulated next month. The amount of prize money offered by the Society is nearly £900 more than at the Inverness Show of 1892, while numerous valuable prizes are contributed by breed societies and private donors. He hoped, and they all hoped, that while Stirling had made a record for the closing year of the old century, Inverness would make a record for the opening of the new century.

Sir JAMES GIBSON-CRAIG submitted the special report on the poultry section, as detailed at the Directors' meeting.

The CHAIRMAN said there was no desire to abandon poultry, but simply to consider the whole question and do the best they could, so as to get the best value for the money expended on this department.

Mr JOHN PRAIN, Longforgan, was much interested in this section, and congratulated the Directors on the decision at which they had arrived. There was a deepening of interest in the poultry of the farm, and it would have been hurtful had the Directors arrived at any other result. He hoped they would do everything in their power to encourage the industry.

Mr HUTCHESON spoke in the same sense. He was very much disappointed with the idea that no poultry should be exhibited at the Highland, and was glad the result had been as indicated.

Mr GEORGE PRENTICE expressed satisfaction that attention was to be given to table poultry, or the commercial side of poultry-keeping.

ABERDEEN SHOW, 1902.

Sir JAMES H. GIBSON-CRAIG, Convener of the Shows Committee, reported upon the arrangements for the Show to be held at Aberdeen in 1902. The town of Aberdeen had been good enough to give the Society a free site for the Show on the Links as on former occasions, and had voted a sum of £100 to the local fund. The County Councils of Aberdeen, Banff, and Forfar had resolved to raise contributions to the local fund by means of a voluntary assessment on owners of lands and heritages. It was learned with regret that the County Council of Kincardineshire had, at a recent

meeting, resolved not to follow the excellent example of the other counties in the Show district in this respect. It is hoped, however, that steps will be taken in Kilmardine to raise a contribution to the local fund by means of private subscriptions.

SHOW OF 1903.

Sir JAMES H. GIBSON-CRAIG moved that, provided satisfactory financial and other arrangements can be made, the Show of 1903 be held in Dumfries district.

Mr TAYLOR seconded.

The motion was unanimously agreed to.

DISTRICT SHOWS.

The MASTER OF POLWARTH submitted the report on district competitions, showing that in 1900 grants of money and medals have been given in 278 districts. The total expenditure under this head amounted to £432. For the current year the Directors proposed the following grants: (1) Under section 1, eleven districts for grants of £12 each for cattle, horses, and sheep, and thirteen districts in intermediate competition with a grant of three silver medals to each; (2) under section 2, ten districts for grants of £15 each for stallions; (3) twenty-three districts for two silver medals each; (4) ploughing competitions, 210 medals; (5) cottages and gardens, twenty-one districts, two medals each. The Directors also recommended the following special grants: £40 to the Highland Home Industries and Arts Association; £20 to the Kilmarnock Dairy Produce Show; £5 to the Shetland Agricultural Society; and £3 each to Orkney, East Mainland, and West Mainland (Orkney) Agricultural Societies. The total sum recommended to be given in 1901 amounts to £465, which was an increase of £33. He was sure the money was well spent, and gave rise to healthy rivalry in the districts.

Agreed.

SCIENCE DEPARTMENT.

Mr MIDDLETON, Clay of Allan, for the Convener of the Science Committee, reported on the work of that Committee. He stated that the report of the feeding experiment with sheep at Airleywight is now in the hands of the printer. It deals chiefly with the relative feeding value of the commoner hy-fodders, and confirms and supplements the results obtained at Chatlock the previous season. Dried grains has again shown itself to be a first-class hy-fodder for sheep, but as the quality of the dried grains in the market varies pretty widely, it is a material that should be purchased under a guarantee of analysis. An interesting part of the experiment was that devoted to the question of hay-feeding. It is the custom in Perthshire to give sheep hay along with turnips and cake, but it is not the custom in Wigtownshire. The result of the experiment at Airleywight is to show that sheep fatten sooner on turnips and linseed-cake alone than they do when hay is given in addition, but in the latter case the delay in feeding is compensated in some measure by the additional weight of mutton obtained. It is a question deserving further investigation. Reports from those who were experimenting with slag are to hand, and as they show very diverse results, the analysis of a selection of the soils where the experiments were tried will now be proceeded with. The results of the experiments upon clover-sickness are still mainly of a negative character, and further investigations are to be made. The Directors have resolved to assist Professor Hamilton of Aberdeen in continuing important investigations as to braxy in sheep. A series of experiments have been arranged with the object of ascertaining whether benefit would be derived from preparing the seed of late potatoes in boxes, as is done with such marked advantage in the case of early potatoes.

FORESTRY.

Sir ROBERT MENZIES moved that the grant of £50 to the Lecturer on Forestry in the Edinburgh University be continued for the current year. He also reported that the examination this year for the Society's certificate in Forestry would be held at the Society's chambers on the 9th, 10th, and 11th April.

Agreed.

Sir ROBERT also referred to the absence of any forestry exhibits at the forthcoming Glasgow Exhibition. So far as forestry was concerned, the exhibition would be a failure.

Mr PRENTICE thought they might have a section at their annual Show of the Society in which some attention was given to this, if it were nothing more than an exhibition of forestry tools.

The Hon. G. WALDEGRAVE LESLIE said they had it on the authority of Sir Robert

Ball that the world was cooling down, and everything should be done to improve forestry with a view to benefiting the crops. He had himself done a little, having planted about three million trees.

The MASTER OF POLWARTH regretted the neglect of forestry in this country. There was a very fine forestry department at the Paris Exhibition, in which Great Britain was conspicuous by its absence.

Sir ARCHIBALD SMEATON-HEPBURN was not surprised at the want of a British section at Paris; they had nothing to show their neighbours in the way of forestry, and he thought it very important that something should be done to improve matters.

Professor WALLACE referred to what had been done in Hereford, where, by judicious planting, three times as much had been taken out of the land as before.

Mr MILNE explained what had been done by the Royal Scottish Arboricultural Society to get a forestry department at the Glasgow Exhibition. They had failed, as the Committee could not spare the room.

Sir ROBERT MENZIES having formally moved, and Mr PRENTICE seconded, a motion that the Directors take the question of having a forestry department at their own Shows, and a section at Glasgow Exhibition, into consideration, this was unanimously agreed to.

EDUCATION.

Mr HUTCHESON, Perth, reported that at the examination held at the Dairy Institute, Kilmarnock, in the first week of October last, for the national diploma in Dairying, there were seven candidates, of whom five obtained the diploma. The next examination in Scotland will take place, as last year, at the Dairy Institute, Kilmarnock, on Monday, 30th September, and three following days. The Directors recommended that a grant of £60 be given for the current year to the Glasgow and West of Scotland Agricultural College, in aid of the expenses in conducting the Kilmarnock Dairy School. He also reported that the next examination for the national diploma in Agriculture would be held, as last year, at the Yorkshire College, Leeds, on Monday, 6th May, and five following days.

PUBLICATIONS.

Mr HUTCHESON, Perth, reported that the volume of the 'Transactions' for the current year was now being printed, and would be issued to members in March. He referred in eulogistic terms to the valuable nature of the book since Mr Macdonald became its editor.

A vote of thanks to the Chairman concluded the proceedings.

APPENDIX

PREMIUMS

OFFERED BY

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND IN 1901

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GENERAL NOTICE.

THE HIGHLAND SOCIETY was instituted in the year 1784, and incorporated by Royal Charter in 1787. Its operation was at first limited to matters connected with the improvement of the Highlands of Scotland; but the supervision of certain departments, proper to that part of the country, having been subsequently committed to special Boards of Management, several of the earlier objects contemplated by the Society were abandoned, while the progress of agriculture led to the adoption of others of a more general character. The exertions of the Society were thus early extended to the whole of Scotland, and have since been continuously directed to the promotion of the science and practice of agriculture in all its branches.

In accordance with this more enlarged sphere of action, the original title of the Society was altered, under a Royal Charter, in 1834, to THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

Among the more important measures which have been effected by the Society are—

1. Agricultural Meetings and General Shows of Stock, Implements, &c., held in the principal towns of Scotland, at which exhibitors from all parts of the United Kingdom are allowed to compete.

2. A system of District Shows instituted for the purpose of improving the breeds of Stock most suitable for different parts of the country, and of aiding and directing the efforts of Local Agricultural Associations.

3. The encouragement of Agricultural Education, under powers conferred by a supplementary Royal Charter, granted in 1856, and authorising the Society to grant Diplomas to Students of Agriculture; and by giving grants in aid of education in Agriculture and allied sciences. In 1900 the Society discontinued its own Examination, and instituted jointly with the Royal Agricultural Society of England an Examination for a National Diploma in Agriculture.

4. The advancement of the Veterinary Art, by conferring Certificates on Students who have passed through a prescribed curriculum, and who are found, by public examination, qualified to practise. Now terminated in accordance with arrangements with the Royal College of Veterinary Surgeons.

5. The institution of a National Examination in Dairying, jointly with the Royal Agricultural Society of England.

6. The institution of an Examination in Forestry for First and Second Class Certificates.

7. The appointment of a chemist for the purpose of promoting the application of science to agriculture, and to superintend local experiments.

8. The establishment of a Botanical Department.

9. The appointment of Entomologist to advise members regarding insect pests.

10. The annual publication of the 'Transactions,' comprehending papers by selected writers, Prize Reports, and reports of experiments, also an abstract of the business at Board and General Meetings, and other communications.

11. The management of a fund left by John, 5th Duke of Argyll (the original President of the Society), to assist young natives of the Highlands who enter Her Majesty's Navy.

CONSTITUTION AND MANAGEMENT.

The general business of THE HIGHLAND AND AGRICULTURAL SOCIETY is conducted under the sanction and control of the Royal Charters, referred to above, which authorise the enactment of Bye-Laws.

The Office-Bearers consist of a President, Four Vice-Presidents, Thirty-two Ordinary and Twenty Extraordinary Directors, a Treasurer, an Honorary and an Acting Secretary, an Auditor, and other Officers.

The Supplementary Charter of 1856 provides for the appointment of a Council on Education, consisting of Sixteen Members—Nine nominated by the Charter and Seven elected by the Society.

PRIVILEGES OF MEMBERS

MEMBERS OF THE SOCIETY ARE ENTITLED—

1. To receive a copy of the 'Transactions' annually
2. To apply for District Premiums that may be offered
3. To report Ploughing Matches for Medals that may be offered
4. To Free Admission to the Shows of the Society.
5. To exhibit Live Stock and Implements at reduced rates.¹
6. To have Manures and Feeding Stuffs analysed at reduced fees
7. To have Seeds tested at reduced fees
8. To have Insect Pests and Diseases affecting Farm Crops inquired into
9. To attend and vote at General Meetings of the Society
10. To vote for the Election of Directors, &c, &c

ANALYSIS OF MANURES AND FEEDING-STUFFS

The Fees of the Society's Chemist for Analyses made for Members of the Society shall, until further notice, be as follow :—

The estimation of one ingredient in a manure or feeding stuff	5s
The estimation of two or more ingredients in a manure or feeding stuff	10s

These charges apply only to analyses made for the sole and private use of Members of the Highland and Agricultural Society who are not engaged in the manufacture or sale of the substances analysed

The Society's Chemist, if requested, also supplies valuations of manures, according to the Society's scale of units.

SEEDS, CROP DISEASES, INSECT PESTS, &c.

The rates of charges for the examination of plants and seeds, crop diseases, insect pests, &c., will be found on pages 34 and 35.

ELECTION OF MEMBERS

Candidates for admission to the Society must be proposed by a Member, and are elected at the half yearly General Meetings in January and June. It is not necessary that the proposer should attend the Meeting.

CONDITIONS OF MEMBERSHIP

The ordinary annual subscription is £1, 3s 6d, and the ordinary subscription for life membership is £12, 12s., or after ten annual payments have been made, £7, 7s. Proprietors farming the whole of their own lands, whose rental on the Valuation Roll does not exceed £500 per annum, and all Tenant Farmers, Secretaries or Treasurers of Local Agricultural Associations, Factors resident on Estates, Land Stewards, Foresters, Agricultural Implement Makers, and Veterinary Surgeons, none of them being also owners of land to an extent exceeding £500 per annum, are admitted on a subscription of 10s. annually, which may be redeemed by one payment of £5, 5s., or, after ten annual payments have been made, by one payment of £3, 3s.² Subscriptions are payable on election, and afterwards annually in January.

Members are requested to send to the Secretary the names and addresses of Candidates they have to propose (stating whether the Candidates should be on the £1, 3s. 6d. or 10s. list).

JAMES MACDONALD, *Secretary.*

3 GEORGE IV. BRIDGE, EDINBURGH.

¹ Firms are not admitted as Members, but if one partner of a firm becomes a Member, the firm is allowed to exhibit at Members rates

² Candidates claiming to be on the 10s list must state under which of the above designations they are entitled to be placed on it

ESTABLISHMENT FOR 1900-1901

President.

DONALD CAMERON OF LOCHIEL, ACHNACARRY, SPEAN BRIDGE,
INVERNESS-SHIRE.

Vice-Presidents.

LORD LOVAT, Beaufort Castle, Beaulieu.
LORD TWEEDMOUTH, Gnisachan House, Beaulieu.
SIR HECTOR MUNRO of Foulis, Bart., Dingwall.
A. MACKINTOSH of Mackintosh, Moy Hall, Inverness.

Ordinary Directors.

Year of
Election.

1897	ALEXANDER CROSS of Knockdon, 19 Hope Street, Glasgow.
	Captain CLAYHILLS HENDERSON of Invergowrie, R.N., Dundee.
	W. T. MALCOLM, Dunmore Home Farm, Larbert.
	Captain ROBERT DUNDAS, yr. of Arniston, Kirkhill, Gorebridge.
	WILLIAM DUTHIE, Tarves, Aberdeenshire.
	JOHN M'CAIG, Challock, Loswalt.
1898	JONATHAN MIDDLETON, Clay of Allan, Feain, Ross-shire.
	The MASTER OF POLWARTH, Humbie House, Upper Keith.
	E. HEDLEY SMITH, B.L., Whittinghame, Prestonkirk.
	WILLIAM CLARK, Netherlea Farm, Cathcart.
	SIR ALAN H. SETON-STEWART of Touch, Bart., Stirling.
	W. S. FERGUSON, Pictstonhill, Perth.
1899	R. SHIRRA GIBB, Boon, Lauder.
	R. W. B. JARDINE, yr. of Castlemilk, Lockerbie.
	ALEXANDER M. GORDON of Newton, Insh, Aberdeenshire.
	J. DOUGLAS FLETCHER of Rosehaugh, Avoch, R.S.O., Ross-shire.
	R. SINCLAIR SCOTT, Burnside, Largs.
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1900	JOHN MURRAY, Munnieston, Kippen Station, Stirling.
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	JOHN MARR, Cairnbrogie, Old Meldrum.
	Rev. JOHN GILLESPIE, LL.D., Mouswald Manse, Ruthwell, R.S.O.
	C. M. CAMERON, Balnakyle, Munlochy.
	C. H. SCOTT PLUMMER of Sunderland Hall, Selkirk.
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	F. W. CHRISTIE, Dairsie Mains, Cupar-Fife.
	DAVID WILSON of Carbeth, Killearn.
	JOHN M'HUTCHEN DOBBIE, Campend, Dalkeith.
	THOMAS GORDON DUFF of Drummair, Keith.
	ROBERT F. DUNGEON of Cargen, The Grange, Kirkcudbright.
	JOHN MACPHERSON GRANT, Old Milton, Kingussie.
	JOHN WILSON, Chapelhill, Cockburnspath.

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	JAMES E B. BAILLIF of Dochfour, Inverness.
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ALFRED M. GORDON of Newton.

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3. Publications . . .	Rev JOHN GILLIESPIE, LL D
4. Shows . . .	SIR JAMES H. GIBSON-CRAIG, Bart.
5. Science . . .	DAVID WILSON of Carbeth.
6. General Purposes	SIR JAMES H. GIBSON-CRAIG, Bart
7. National Diplomas	Rev. JOHN GILLESPIE, LL.D.
8. Forestry . . .	SIR ROBERT MENZIES, Bart.

COMMITTEES FOR 1900-1901

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 E. HEDLEY SMITH, B.L., Whittinghame, Prestonkirk.
 Captain CLAYHILL HENDERSON of Inveigowrie, R.N., Dundee.
 DR AITKEN, Chemist, *ex officio*.
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 ALEX. M. GORDON of Newton, Inch, Aberdeenshire.
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Rev. JOHN GILLESPIE, LL.D., Mouswald Manse, Ruthwell, R.S.O., *Convener*.
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 JOHN SPEIR, Newton Farm, Newton, Glasgow.
 DAVID WILSON of Carbeth, Killearn.
 JAMES MACDONALD, *Secretary*.

8. FORESTRY.

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 JOHN MEIHVEN, 15 Princes Street, Edinburgh
 Colonel F. BAILEY, 7 Dumbond Place, Edinburgh
 WILLIAM DUNN, Kenmore, Aberfeldy.
 DAVID KEIR, Ladywell, Dunkeld.
 JOHN MICHIE, Balmoral, Ballater.
 A. PITCAITHLEY, Jeanie Bank, Old Scone, Perth

The President, Vice-Presidents, the Treasurer, Honorary Secretary, and Chairman of Directors are members *ex officio* of all Committees.

MEETINGS.

General Meetings.—By the Charter the Society must hold two General Meetings each year, and, under ordinary circumstances, they are held on the third Wednesday of the months of January and June, at one o'clock, in the Society's Hall, 3 George IV. Bridge, for the election of Members and other business. Twenty a quorum.

By a resolution of the General Meeting on 15th January 1879, a General Meeting of Members is held in the Showyard on the occasion of the Annual Show. This year it will be held at Inverness, on Wednesday, 17th July, at an hour to be announced in the programme of the Show.

With reference to motions at General Meetings, Bye-Law No. 10 provides—"That at General Meetings of the Society no motion or proposal (except of mere form or courtesy) shall be submitted or entertained for immediate decision unless notice thereof has been given a week previously to the Board of Directors, without prejudice, however, to the competency of making such motion or proposal to the effect of its being remitted to the Directors for consideration, and thereafter being disposed of at a future General Meeting."

General Show at Inverness—16th, 17th, 18th, and 19th July.—Entries close for Implements, 13th May; Stock, Poultry, and Dairy Produce, 10th June.

Directors' Meetings.—The Board of Directors meet (except when otherwise arranged) on the first Wednesday of each month from November till June inclusive, at half-past one o'clock p.m., and occasionally as business may require, on a requisition by three Directors to the Secretary, or on intimation by him. Seven a quorum.

Nomination of Directors.—Meetings of Members, for the purpose of nominating Directors to represent the Show Districts on the Board for the year 1901-1902, will be held at the places and on the days after mentioned:—

1. Edinburgh, 3 George IV. Bridge, . . . Wednesday, 13th Feb., at 2.
2. Glasgow, North British Station Hotel, . . . Wednesday, 20th Feb., at 1.
3. Stirling, Golden Lion Hotel, . . . Friday, 22nd Feb., at 1.30.

4. Perth, Salutation Hotel, . . . Friday, 1st March, at 2.
5. Kelso, Cross Keys Hotel, . . . Friday, 8th March, at 12.30.
6. Dumfries, King's Arms Hotel, . . . Wednesday, 13th March, at 1.
7. Aberdeen, Imperial Hotel, . . . Friday, 15th March, at 2.
8. Inverness, Station Hotel, . . . Tuesday, 19th March, at 12.30.

The nomination of Proprietors or other Members paying the higher subscription must be made in the 1st, 2nd, 4th, and 5th Districts ; and the nomination of Tenant-Farmers or other Members paying the lower subscription, in the 3rd, 6th, 7th, and 8th Districts.

Committee Meetings.—Meetings of the various Committees are held as required.

EXAMINATIONS.

Agriculture.—The Examination for 1901 for the National Diploma in Agriculture will be held at the Yorkshire College, Leeds, on Monday, 6th May, and five following days. Entries close on Saturday, 30th March.

Forestry.—The Examination for 1901 for the Society's Certificates in Forestry will be held at the Society's office, on Tuesday, Wednesday, and Thursday, 9th, 10th, and 11th April. Entries close on 18th March.

Dairy.—The Examination for 1901 for the National Diploma in Dairying will be held at the Kilmarnock Dairy School, on Monday, 30th September, and three following days. Entries close on 31st August.

AGRICULTURAL EDUCATION

By a Supplementary Charter under the Great Seal, granted in 1856, the Society is empowered to grant Diplomas.

From 1858 to 1899 the Society held an annual Examination for Certificate and Diploma in Agriculture, winners of the Diploma (F.H.A.S.) being elected Free Life Members of the Society.

In 1898 it was resolved by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland to discontinue the independent Examinations in Agriculture held by the two Societies, and to institute in their stead a Joint-Examination for a NATIONAL DIPLOMA IN AGRICULTURE (N.D.A.) This Examination is now conducted under the management of the "National Agricultural Examination Board" appointed by the two Societies. The following are the Members of this Board appointed by the Highland and Agricultural Society for the current year, viz :—

Rev. JOHN GILLESPIE, LL.D., Mouswald Manse, Ruthwell, R.S.O.

DAVID WILSON of Carbeth, Killearn.

ALEXANDER CROSS of Knockdon, 19 Hope Street, Glasgow.

JOHN SPEIR, Newton Farm, Newton, Glasgow.

JAMES MACDONALD, *Secretary*.

REGULATIONS AND SYLLABUS OF THE EXAMINATION FOR THE NATIONAL DIPLOMA IN THE SCIENCE AND PRACTICE OF AGRICULTURE.

REGULATIONS.

1. The Societies may hold conjointly, under the management of the National Agricultural Examination Board appointed by them, an annual Examination in the Science and Practice of Agriculture, at a convenient centre.

2. Candidates who pass the Examination will receive the National Diploma in Agriculture—the Diploma to be distinguished shortly by the letters "N.D.A."

3. The Examination will be conducted by means of written papers and oral Examinations.

4. The Examination must be taken in Two Parts as follows :—

First Part.

1. Mensuration and Land Surveying.
2. Agricultural Botany.
3. General Chemistry.
4. Geology.
5. Agricultural Entomology.

Second Part.

6. Practical Agriculture.
7. Agricultural Book-keeping.
8. Agricultural Chemistry.
9. Agricultural Engineering.
10. Veterinary Science.

5. The maximum number of marks obtainable and the minimum number of marks in each subject qualifying for the Diploma will be as follows :—

First Part—

SUBJECT.	Max. No. of Marks.	Pass Marks for Diploma.
1. Mensuration and Land Surveying	200	120
2. Agricultural Botany	200	120
3. General Chemistry	100	60
4. Geology	100	50
5. Agricultural Entomology	100	50

Second Part—

6. Practical Agriculture	500	300
7. Agricultural Book-keeping	200	120
8. Agricultural Chemistry	200	120
9. Agricultural Engineering	200	120
10. Veterinary Science	100	50

6. A Candidate who obtains not less than three-fourths (1425) of the aggregate maximum marks (1900) in the entire Examination will receive the Diploma with Honours, provided (a) that he passes each of the two Parts of the Examination at the first attempt, and (b) that he obtains not less than three-fourths (375) of the maximum marks (500) in the subject of Practical Agriculture

7. A Gold Medal will be awarded to the Candidate on the Honours List who obtains the highest number of total marks in the whole Examination.

8. A Candidate will not be entitled to take both Parts of the Examination at one time. A year at least must elapse between the passing of the First Part and sitting for the Second Part; and the Second Part must, except with the special permission of the Board, be taken within two years of the passing of the First Part

9. A deposit of £1 will be required from each Candidate for each Part of the Examination. This deposit will be returned only to those who at the first attempt obtain Pass marks in all the subjects included in that Part. The Board may at their discretion allow an unsuccessful Candidate to sit for one subsequent Examination in the same Part without payment of a further deposit.

10. A Candidate who fails to obtain Pass marks in any of the subjects in the Part for which he is sitting must take the entire Part again.

11. Holders of both the First Class Certificate of the Royal Agricultural Society of England and the Diploma of the Highland and Agricultural Society of Scotland will not be eligible for this Examination; holders of only one of these distinctions may enter for this Examination in 1901.

12. The Board reserve the right to postpone, abandon, or in any way, or at any time, modify an Examination, and also to decline at any stage to admit any particular Candidate to the Examination.

The Examination of 1901 will take place in the Great Hall of the Yorkshire College, Leeds, on Monday, 6th May 1901, and five following days. Forms of application for permission to sit at the Examination may be obtained from either of the undersigned, and must be returned duly filled up not later than Saturday, the 30th March 1901, when the Entries will close.

BY ORDER,

ERNEST CLARKE,

Secretary, Royal Agricultural Society of England,
13 HANOVER SQUARE, LONDON, W.

JAMES MACDONALD,

Secretary, Highland and Agricultural Society of Scotland,

3 GEORGE IV. BRIDGE, EDINBURGH.

SYLLABUS OF SUBJECTS OF EXAMINATION.

FIRST PART.

I.—MENSURATION AND LAND SURVEYING.

1. Ordinary rules of superficial and solid mensuration. Volume of a prismoid. Applications to practical questions. Estimation of weights of bodies whose dimensions and specific gravity are known.

2. Land surveying by chain. Plotting from field-book, and determination of areas surveyed. The simpler "field problems."

3. The use and adjustment of instruments employed in Surveying and Levelling.

4. Levelling and plotting from field-book.

5. A sufficient knowledge of Trigonometrical Surveying for the determination of heights and distances by Theodolite; as essential to this, solution of plane triangles by the aid of Logarithmic Tables.

6. A knowledge of the various classes of maps published by the Ordnance Survey Department and their Scales.

N.B.—*Each candidate should have with him at the Examination a pair of compasses, scales of equal parts, including a scale of one chain to an inch, and the scale fitting the Ordnance map, $\frac{1}{25000}$, or 25'344 inches to the mile, a small protractor, a set square, and a straight-edge about 18 inches in length.*

II.—AGRICULTURAL BOTANY.

1. *Morphology*.—The structure of plants. The principles of classification. The Natural Orders (Phanerogams and Cryptogams) dealing specially with those of importance to the Agriculturist.

2. *Physiology*.—The life of the plant. Organs and their functions—nutritive and reproductive.

3. *Pathology*.—Diseases of plants, and their causes. Parasites—Phanerogams, Fungi, Bacteria. Prevention and cure.

4. *Cultivation*.—Conditions in plant life favourable to (a) the improvements of cultivated plants, and (b) the destruction of weeds. New varieties of plants. Pastures. Pruning.

N.B.—*Candidates will be required to identify plants usually found on a farm.*

III.—GENERAL CHEMISTRY.

1. *The Chemical Elements*.—Definition and classification of elements. Occurrence in nature and leading characters of the elements most commonly met with.

2. *Common Chemical Compounds*.—Preparation and properties of common products of inorganic chemistry (such as the mineral acids, alkalies, salts, &c.)

3. *Laws and Theory*.—The laws of chemical combination. Explanation of equivalence. Distinction of chemical and mechanical compounds. Laws of gaseous diffusion. The atmosphere. Theory of combustion.

4. *Analysis*.—Qualitative and quantitative analysis of atmospheric air. Quantity of air required in combustion. Qualitative analysis of common inorganic substances. Quantitative analysis in simple cases (such as the determination of strength of solutions, proportions of acids and bases in simple salts) by volumetric and gravimetric methods. Ultimate organic analysis by combustion. Proximate analysis by solvents; dialysis and fractional distillation.

5. *Carbon Compounds*.—Ordinary alcohol and ether, and the most common ethylic salts. Oxalic acid, lactic acid, acetic acid and its homo-

logues, fats, glycerine, and soap. Paraffins. Phenol. Cyanogen and its most common compounds, urea, and uric acid. Saccharine and amylaceous compounds. Turpentine and resin. Tannin. Albumen. Gelatine. Fermentation.

N.B.—*In this section exact knowledge of general principles and typical compounds is expected, rather than diffuse information.*

IV.—GEOLOGY.

1. Chief minerals entering into the composition of rocks. Origin and composition of aqueous and igneous rocks. General principles of the classification of rocks. Leading divisions of the stratified rocks, and their geographical distribution in the British Islands.

2. Stratification, cleavage, and faulting of rocks.

3. Influence of the geological structure of a country on the configuration of the land and the composition of the soil. Relation of Strata to water-supply and drainage. Origin of springs.

4. The various mineral manures, their sources, characters, and mode of occurrence.

5. Different kinds of building-stones and road materials. Distribution of the various economical substances.

N.B.—*Candidates will be required to name and describe common rocks, minerals, and fossils.*

V.—AGRICULTURAL ENTOMOLOGY.

1. The position of Insects in the Animal world, with the characters that mark them out from related animal groups.

2. *General Structure of Insects*.—Head, Thorax, Abdomen, Alimentary Canal, Circulation, Respiratory System, Nervous System and Sense Organs, Reproductive System.

3. *Metamorphosis of Insects*, with the economic importance of the different stages.

4. *Classification of Insects*—The general characters of the following Natural Orders: Coleoptera, Lepidoptera, Hymenoptera, Diptera, Hemiptera, Orthoptera, Neuroptera.

5. *Larvæ*.—Their varying forms as a help to identification.

6. The *Life-history* of the Insects, Worms, and Acarines injurious to Food Crops generally and to Live Stock. Recognition of the common pests by external characters and by their work.

7. Insects useful in Agriculture.

8. Circumstances favouring Insect increase. Farm practice in relation to the discouraging of Insect attack.

9. *Preventive and Remedial Measures*.—Encouragement of Insect-eating birds and mammals. Fungoid diseases of Insects. Artificial remedies. Insecticides and their composition and preparation.

N.B.—*Practical acquaintance with common insects, worm parasites, &c., will be expected. Where the Candidate is not acquainted with the scientific name of an Insect, the generally received English name will be accepted.*

SECOND PART.

VI.—PRACTICAL AGRICULTURE.

1. *Soils*.—Classification of soils—characters and composition—suitability for cultivation.

2. *Improvement of Soil*.—Drainage, Irrigation, and Warping. The application of lime—marl—clay—ashes, &c.

3. *Rotations*.—The principles of rotations—rotations suitable for different soils and climates—systems of farming.

4. *Manures*.—The properties of manures—general and special—amounts used per acre—period and mode of application—treatment and disposal of sewage.

5. *Food-stuffs*.—The properties of feeding substances—their suitability for different classes of farm stock—considerations affecting their use—rations for different classes of stock.

6. *Crops*.—Farm crops (cereals, agricultural grasses and clovers, forage plants and roots). How they grow—their cultivation, including cleaning, harvesting, and storage—diseases—insect injuries and remedies.

7. *Weeds and Parasitic Plants*.—Best methods of eradication.

8. *Pests of the Farm*.—Injuries to crops and live stock of the farm due to mammals, birds, and insects, with their prevention and remedies.

9. *Weather*.—Meteorology, or the effect of climate on farming conditions.

10. *Live Stock*.—The breeding, rearing, feeding, and general treatment of farm stock—the different breeds of horses, cattle, sheep, pigs, and poultry—their characteristics—the districts where they are generally met with.

11. *Milk*.—The production and treatment of milk—the manufacture of cheese, butter, &c.—the utilisation of bye-products.

12. *Machinery*.—The uses and prices of the machines and implements used in farming in different parts of Great Britain.

13. *Buildings*.—Buildings required on different classes of farms in various districts.

14. *Farming Capital*.—Calculations of the cost of stocking and working arable, stock, and dairy farms. Farm valuations. Rent, taxes, and cost of labour.

N.B.—*It is essential that a Candidate know his subject practically, and that he satisfy the Examiner of his familiarity with farm routine. Candidates will be expected to illustrate their answers when necessary by intelligible sketches or diagrams.*

VII.—AGRICULTURAL BOOK-KEEPING.

1. Agricultural Book-keeping—Description of books to be kept, with examples.

2. Valuation of stock and effects.

3. Profit and Loss, and Balance Sheet.

VIII.—AGRICULTURAL CHEMISTRY.

1. *Soil*.—The origin, formation, and classification of soils. The constituents of soils. The supply of plant-food by the soil. The chemical and physical properties of soils of different kinds. The adaptation of soils to particular crops. The relations of air and water to soils. Nitrification and the biology of the soil. The chemical and physical effects of tillage operations and drainage. The improvement of soils. Causes of infertility. Mechanical and chemical analysis of soils.

2. *Plant-life*.—The constituents of plants. The relations of atmosphere, rainfall, heat, and light to vegetation. The sources of plant-food.

3. *Manures*.—The supply of plant food by manure. The improvement of the soil by manuring. The classification of manures as regards their composition, nature, and use. The manures in general use upon the farm. Farmyard manure and other natural manures. Green-manuring. Liming, marling, claying. Artificial manures, their origin and manufacture. The changes which manures undergo in the soil. The influence

of drainage. The application of manures. The analysis of manures. The adulteration of manures.

4. *Crops*.—The composition of the principal farm crops. Characteristics of particular kinds of crops. The influence of climate and season. The manuring of particular crops. The changes that take place in crops during the various stages of their growth. Rotation of crops.

5. *Foods*.—The constituents of foods, and their functions. The nutritive value and digestibility of foods. The chemical composition and use of the principal feeding-stuffs employed on the farm, and the sources of their supply. The main facts regarding respiration and digestion. The relation of foods to the production of work, meat, milk, and manure. The adaptation of foods to special requirements. The residual manurial value of foods, and the circumstances affecting it. The estimation of un-exhausted fertility. Analysis and adulteration of foods.

6. *Water*.—Rain-water. Hard and soft waters. Drinking waters. Irrigation and sewage.

7. *Dairying*.—The composition of milk, and the conditions which influence its quality and supply. Cream and cream-separation. Butter and butter-making. Cheese and cheese-making. The influence of ferments on milk and milk products. The preservation of milk. Milk-testing.

IX.—AGRICULTURAL ENGINEERING.

1. *Heat*.—Nature of heat ; thermometer ; absolute zero ; specific heat ; latent heat ; the unit of heat. Total heat of water ; as ice, water, and steam. Conduction, convection, and radiation of heat. Mechanical equivalent of heat. Principle of combustion. Quantity of heat generated by combustion. Modes of transforming heat of combustion into power, as in the steam-engine, and gas and oil engine.

2. *Air*.—Properties of air ; elasticity, specific heat. Barometer. Moisture. Movement. Winds. Windmills.

3. *Water*.—Composition. Weight. Height of column to balance atmosphere. Flow of water. Friction of water in pipes and channels. Usual speed of flow. Power derived from falls of water. Water-wheels ; turbines ; water-pressure engines ; pumps. Potable water. Sources of supply. Means of purification. Storage.

4. *Mechanics*.—Centre of gravity ; stability of structures. The lever ; toothed wheels ; pulleys and ropes ; wrapping connectors ; winches ; differential pulleys. Laws of motion. Strength of materials, tensile, compressive, torsional, and transverse ; elastic limit ; ultimate strength. Work ; horse-power ; animal and human power. Friction of surfaces and axles ; lubrication.

5. *Steam-engine*.—Construction of an ordinary portable-engine boiler, of a Cornish boiler, and its setting. Fittings of a boiler. Construction of the stationary and portable steam-engine. Single cylinder. Double cylinder. Compound. Slide-valve. Expansion valve. Cylinder. Piston-rod. Glands. Connecting-rod. Crank and crank shaft. Fly-wheel. Bearings. Pet cocks. Lubrication. Steam and fuel consumed per horse-power.

6. *Gas and Petroleum Engines*.—Principle of action. Construction of valve-gear. Sources of loss. Fuel and water required per horse-power.

7. *Electrical Generators, Motors, and Conductors*.—Principles of action—shunt ; losses in electrical machinery. Efficiency. Detection of faults. Regulation of shunt and series motors. Use of fuses and cut-outs. Horse-power of motors, and calculation of Watts to be delivered at terminals. Ohm's law. Losses in conductors, and calculation of sizes to convey given currents with definite losses. Jointing and insulation of conductors.

8. *Construction of Agricultural Implements.*—The mode of action and the general principles involved in the construction of farm implements. The adjustments of implements for different descriptions of work. Lubrication. Working or wearing parts.

9. *Cultivating Implements worked by Steam Power.*

10. *Horse-cultivating Implements.*—Ploughs. Cultivators or Grubbers. Harrows. Rollers. Scrubbers, &c.

11. *Sowing Implements.*—Drills. Manure and water drills. Broadcast barrows. Broadcasters. Manure distributors. Potato planters, &c.

12. *Hoeing Implements.*—Horse-hoes. Scufflers.

13. *Securing of Crops.*—Reaping machines. Mowing machines. Hay-makers. Horse-rakes. Elevators. Silage appliances. Potato raisers, &c.

14. *Carriages.*—Carts. Waggon. Sleighs. Rick-lifters, &c.

15. *Preparing Crops for Market.*—Threshing machines. Winnowing machines. Corn screens. Hummellers. Hay and straw presses, &c.

16. *Preparing Foods.*—Mills. Chaff-cutters. Pulpers. Turnip-cutters. Cake-breakers. Cooking apparatus.

17. *Dairy Appliances.*—Cream separators. Churns. Butter-workers. Cheese tubs. Curd mills. Cheese presses. Setting-pans. Refrigerators, &c.

18. *Land Improvement.*—Drainage instruments. Limekilns. Arrangements of shafting, pulleys, clutches, &c., for farm machinery at home-steads.

N.B.—*Marks will be given for neatness and accuracy of Drawing.*

X.—VETERINARY SCIENCE.

1. Anatomy and Physiology, including the comparative anatomy of the bones of the animals of the farm, and the structure and functions of the different organs and tissues of the horse, ox, sheep, and pig.

2. The digestive processes and principles of nutrition in the above animals.

3. A general knowledge of the blood and its circulation, and the processes of respiration, secretion, and excretion.

4. The physiology of reproduction, and its bearings on healthy breeding.

5. The period of gestation in the mare, cow, ewe, and sow, and the special management of these animals prior to, at the time of, and after parturition.

6. The management of farm stock in health and disease.

PAST EXAMINATION PAPERS.

Copies of the Papers set at the Examination in 1900 may be had on application. Price 6d. per set.

VETERINARY DEPARTMENT

The Society established a Veterinary Department in 1823, but by an arrangement made with the Royal College of Veterinary Surgeons, the Society's examination ceased in 1881. Holders of the Society's Veterinary Certificate are entitled to become Members of the Royal College of Veterinary Surgeons on payment of certain fees, without being required to undergo any further examination. The number of Students who passed for the Society's Certificate is 1183.

The Society votes annually eleven silver medals for Class Competition to each of the two Veterinary Colleges in Edinburgh, and to the one in Glasgow.

FORESTRY DEPARTMENT

The Society grants FIRST and SECOND CLASS CERTIFICATES in FORESTRY.

In 1900 it was resolved that the examination in Forestry be held in 1901, and thereafter every alternate year

BOARD OF EXAMINERS.

Science of Forestry, Practical Management of Woods, and Forest Entomology.—COLONEL BAILEY, Lecturer on Forestry, Edinburgh University, 7 Drummond Place; Dr SOMERVILLE, The University, Cambridge; J. GRANT THOMSON, Grantown, Strathspey; D. F. MACKENZIE, Mouton Hall, Liberton, Mid-Lothian; ANDREW SLATER, Osborne, Isle of Wight.

Forest Botany and Zoology.—Professor BAYLEY BALFOUR, A. N. M'ALPINE, and Dr R. S. M'DOUGALL.

Physics, Chemistry, and Meteorology.—Dr A. P. AITKEN and Dr WM. CRAIG.

Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to Fencing, Drainage, Bridging, and Road-making.—A. W. BELFRAGE, C.E., Edinburgh.

Book-keeping and Accounts.—WM. HOME COOK, C.A., Edinburgh.

Candidates must possess—1. A thorough acquaintance with the theory and practice of Forestry. 2. A general knowledge of the following branches of study, so far as these apply to Forestry: The Elements of Botany; The Elements of Physics, Chemistry, and Meteorology; Forest Entomology; Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to fencing, draining, bridging, and road-making; Implements of Forestry; Book-keeping and Accounts.

The examinations¹ are open to candidates of any age, will be both written and oral, and will include such practical tests as may from time to time be found convenient to apply.

¹ The Examination in 1901 will be held on the 9th, 10th, and 11th April. Entries close 18th March. The next Examination thereafter will be held in the spring of 1903.

The maximum number of marks for each subject is 100 ; First-Class marks in all subjects 75, Second-Class marks in all subjects 50, Pass marks in all subjects 40.

To obtain the *First-Class Certificate* a Candidate must have First-Class marks in Forestry and any two of the other subjects, and Pass in the two remaining subjects. To obtain the *Second-Class Certificate* a Candidate must obtain Second-Class marks in Forestry and in any two of the other subjects, and Pass in the two remaining subjects.

If a Candidate has obtained First-Class marks in Forestry and failed in only one or two of the other subjects, he can come up again for examination in these subjects alone for the *First-Class Certificate*, otherwise he must go through the entire examination again.

The list of students who obtained Certificates prior to 1899 appears in the 'Transactions,' Fifth Series, vol. xi. (1899).

The following obtained First-Class Certificates in 1899:—

ERIC ARTHUR NOBBS, Edinburgh.

GEORGE POTTS, Whitehurworth, Trimdon Grange, Durham.

SYLLABUS OF EXAMINATION

I.—SCIENCE OF FORESTRY AND PRACTICAL MANAGEMENT OF WOODS.

1. *Principles of Scientific Forestry*.—1. Effects of heat, light, moisture, and air-currents on forest vegetation. 2. Effects of depth, porosity, moisture, and chemical composition of the soil on forest vegetation. 3. Effects of forest vegetation on the soil and air. 4. Rate and extent of development, longevity, and reproductive power of trees. 5. Pure and mixed woods. 6. Systems of silviculture.

11. *Practical Management of Woods*.—7. Draining and irrigation. 8. Choice of species for various situations. 9. Seed and sowing, including nurseries. 10. Planting. 11. Natural regeneration by seed, shoots, and suckers. 12. Formation of mixed woods. 13. Tending of young woods. 14. Pruning. 15. Thinning. 16. Silvicultural characteristics of the principal trees.

III. *Injuries by Storms and Fires*.—17. Storms. 18. Fires.

IV. *Timber*.—19. Its technical properties. 20. Its defects. 21. Recognition of different kinds of timber. 22. Processes for increasing its durability.

V. *Utilisation of Produce*.—23. Uses of wood and other produce. 24. Felling. 25. Conversion. 26. Seasoning. 27. Transport. 28. Sales. 29. Harvesting of bark.

VI. *Forest Organisation*.—30. General ideas regarding a regulated system of forest management.

Books recommended.—Schlich's 'Manual of Forestry'; Nisbet's 'British Forest Trees'; Nisbet's 'Studies in Forestry'; Fürst's 'Protection of Woodlands,' translated by Nisbet; Hough's 'Elements of Forestry'; Brown's 'Forester' (latest edition); Laslett's 'Timber and Timber Trees.'

II.—FOREST BOTANY AND FOREST ZOOLOGY.

(a) FOREST BOTANY.

The fundamental facts of morphology, physiology, and classification of plants. The structure and function of the plant-cell and the plant-tissues. Their primary distribution. The secondary changes they exhibit in consequence of perennation.

The structure and function of the root and shoot in flowering-plants. Buds, their forms and uses. The flower. The fruit. The seed.

The structure and function of vegetative and reproductive organs of fungi.

Relationship of plants to air, soil, and water. Effect of light, heat, and mechanical agencies upon plants. Nutrition. The nature and elements of the food of plants. Sources of plant-food. The absorption, elaboration, transference, and storage of food. Respiration and transpiration. Parasites and saprophytes. Symbiosis.

Growth of plants in length and thickness. Correlation of growth, pruning. Germination of seeds. Formation of wood and bark. Healing of wounds.

Diseases of plants due to faulty nutrition and unfavourable circumstances of growth. Diseases due to attacks of fungi.

Natural reproduction and propagation by seeds and by buds. Fertilisation of flowers. Hybridisation. Artificial propagation by budding, grafting, layering, and cutting.

The characters of the large groups and ~~classes~~ of the vegetable kingdom. The characters of the families of plants which include the chief timber trees. The botanical characteristics of the principal British forest-trees (including the structural features of their wood). The weeds of the forest and their significance.

Books recommended.—Scott, 'Structural Botany'; Prantl and Vines, 'Text-Book of Botany'; Marshall Ward, 'Timber and some of its Diseases'; Marshall Ward, 'Diseases of Plants'; Marshall Ward, 'The Oak'; Schlich's 'Manual of Forestry,' vol. ii., Appendix to chapter iv., by Marshall Ward; Hartig, 'Timbers, and how to know them,' translated by Somerville; Hartig, 'Anatomy and Physiology of Plants,' translated by Nisbet; Hartig, 'Diseases of Plants,' translated by Marshall Ward and Somerville; Warming, 'Handbook of Systematic Botany,' translated by Potter; Bower, 'Practical Botany for Beginners.'

(b) FOREST ZOOLOGY.

The group Insecta: its position in the animal kingdom. Structure, mode of reproduction, and metamorphosis of insects. The outlines of classification of the group. Conditions favourable to the numerical increase of insects. Natural checks to increase (*e.g.*, birds, mammals, parasitic insects). The identification and life-history of the more important insects injurious to forest-trees and fruit-trees. The damage caused by these insect pests and their mode of attack. The damage caused by animals. Preventive and remedial measures.

* *Books recommended.*—Ormerod, 'Manual of Injurious Insects'; Fürst, 'Protection of Woodlands,' translated by Nisbet; various articles in 'Transactions' of Highland and Agricultural Society and of Royal Scottish Arboricultural Society.

III.—PHYSICS, CHEMISTRY, AND METEOROLOGY.

Physics.

Mass, weight, specific gravity, solid, liquid, and gaseous states of matter. Capillarity, osmose, vapour tension, suction pump, force pump, syphon, barometer, atmospheric pressure. Boyle's law. Levers and pulleys. Heat, measurement of heat, specific heat; transference of heat by conduction, convection, and radiation. Boiling and freezing. Latent heat. The thermometer. The conservation and transformation of energy. Light—reflection, refraction, polarisation; the spectrum. The rudiments of electricity and magnetism.

Chemistry.

Elements. Oxygen, hydrogen, nitrogen;—their preparation, properties, and chief compounds. Acids, bases, salts. Combustion, oxidation, reduction. Sulphur, Carbon, Phosphorus; and their compounds, with oxygen and hydrogen. Metals—potassium, sodium, calcium, magnesium, aluminium, iron, copper, lead, mercury, and their chief compounds. Carbohydrates, marsh gas, olefiant gas, alcohol, acetic acid, oxalic acid. Distillation of wood and coal.

Meteorology.

The atmosphere, its composition and physical properties. Measurement of pressure and temperature. The barometer. Rain, hail, snow, fog, cloud, dew, the dew point, hoar frost. The weathering of rocks and soils. Gases injurious to vegetation.

Books recommended.—‘Elementary Physics,’ Balfour Stewart; ‘Lessons in Elementary Chemistry,’ Roscoe; ‘Introductory Text-Book of Meteorology,’ Buchan.

IV.—LAND AND TIMBER MEASURING AND SURVEYING; MECHANICS AND CONSTRUCTION AS APPLIED TO FENCING, BRIDGING, AND ROAD-MAKING.

1. The use of the level and measuring-chain. Measuring and mapping surface areas. 2. The measurement of solid bodies—as timber, stacked bark, fagots, &c., earthwork. 3. The different modes of fencing and enclosing plantations; their relative advantages, durability, cost of construction, and repairs. 4. The setting out and formation of roads for temporary or permanent use. 5. The construction of bridges over streams and gullies; of gates or other entrances.

Books recommended.—‘Agricultural Surveying,’ by John Scott (Weale's Series); Hoppus's ‘Tables’; ‘Farm Roads, Fences, and Gates,’ by John Scott (Weale's Series); Brown's ‘Forester’ (latest edition).

V.—BOOK-KEEPING AND ACCOUNTS.

1. Questions in Practice, Proportion, and Decimal Fractions. 2. Book-keeping—describe books to be kept; and best method of valuing timber. 3. Practical questions in Book-keeping will also be given.

Book recommended.—Brown's ‘Forester’ (latest edition).

EXAMINATION PAPERS, 1900

PRACTICAL FORESTRY.

1. A plantation 80 years of age, 100 acres in extent, bearing a crop of Scots fir trees, averaging 16 cubic feet and 200 trees to the acre, was visited by a storm of wind, which threw over in a clean sweep about 20 acres of the crop in the middle of the wood, and thinned out a considerable number of trees all over the ground.

Describe the best method of marking, classifying, and selling the wind-fallen trees, and of clearing and preparing the ground for a future planted crop (no draining required). The ground is level and of a gravelly nature; describe how you would replant it, and what variety of plants you would use; give also the expense per acre of replanting the bared ground.

2. A considerable area is under a partial crop of matured trees; the undergrowth is grass, brackens, whins (gorse), and heather. Describe the best method of dealing with the above so as to prepare the ground for a new crop, and give your views as to any time which might be allowed to elapse between clearing and replanting.

3. A lot of trees for sale consists of 500 ash-trees, large size, 300 oaks up to 14 inches on side, 60 beeches of 40 cubic feet, 200 larches of 30 cubic feet, 3000 larches of 10 cubic feet, 1000 larches 20 feet long and 3 inches in diameter at small end. Describe how you would mark the trees for sale. Write out an advertisement for the above, and draw up conditions of sale; also conditions to be offered to contractors for felling, branching, and cross-cutting the lot.

4. A Scots fir wood, planted $3\frac{1}{2}$ feet by $3\frac{1}{2}$ feet, is destined to produce pit-wood at 40 years of age, when it is assumed that the poles will be about 50 feet high and $6\frac{1}{2}$ inches in diameter at breast height.

Describe the thinnings that may be expected to be made during the progress of the crop, and state the number of poles that may probably stand on the ground at felling time.

5. Compare and explain the difference in the effects produced on the soil by a full crop of pure beech and by a full crop of pure oak.

6. Give details regarding the process of creosoting timber, and describe its effects.

Describe the seasoning of Scots pine boards and of spruce boards. What is, on an average, the percentage of water in freshly felled timber, and in timber which has been thoroughly air-dried?

(Two hours allowed.)

FOREST BOTANY AND FOREST ZOOLOGY.

Candidates are expected to answer five questions—three from the Section of Forest Botany, and two from the Section of Forest Zoology.

(a) FOREST BOTANY.

1. Give an account of the structural conditions which accompany leaf-fall in a forest-tree.

2. Describe the characters of the seedling in the chief British forest-trees.

3. Write an account of the life-history of *Nectria cinnabarina*. What is its importance in relation to the life of a tree?

4 State what you know of the channels through which water passes to the top of a forest-tree and of the agencies concerned in the movement of the water.

(b) FOREST ZOOLOGY.

1. What are the general characters of the order Hymenoptera or the order Coleoptera? Name two useful and two injurious insects belonging to the order chosen, and say what harm they do or why you consider them useful.

2. What moth-caterpillars tunnel in the wood of trees? Give the life-history of one, and say how you would proceed against it.

3. What is your attitude to the squirrel in Forestry, and why?

(Two hours allowed.)

PHYSICS, CHEMISTRY, AND METEOROLOGY.

1. Explain how it is that water rises in the soil above the level of the drains.

2. Explain what is meant by latent heat, and show how it is that the latent heat of water and steam affect the climate of a country.

3. How is sulphurous acid gas produced? How is it converted into sulphuric acid?

4. Distinguish between a Ferrous and a Ferric salt. How may each be converted into the other?

5. Explain what are the conditions favourable to the formation of dew.

6. At 1000 feet above sea level the barometer stood at 29.5 inches; what height would it stand at sea level?

(An hour and a half allowed.)

LAND AND TIMBER MEASURING AND SURVEYING;
MECHANICS AND CONSTRUCTION AS APPLIED TO FENCING,
BRIDGING, AND ROAD-MAKING.

1. The difference in level between two points 1200 feet apart, where it is desired to lay a drain, is 2.32 feet: give the inclination of the drain.

2. Assume a length of 863 links: what width is required to give 2½ acres?

3. Calculate the capacity of a tank 10 feet 6 inches wide, by 15 feet 2 inches long, by 3 feet 3 inches deep, giving the result in gallons.

4. Describe, with sketch, and give approximate cost per yard, unclimbable fence round enclosure near town.

5. Give specification and sketch of cross section of farm road.

6. Give sketch, with dimensions, of strong wooden gate suitable for farm purposes.

7. Give sketch, with dimensions, and short specification of bridge, 20 feet wide, formed with steel joists and concrete, over burn 8 feet between banks.

(Two hours allowed.)

ARITHMETIC AND BOOK-KEEPING.

1. Simplify—

$$\frac{\frac{5}{18} + \frac{7}{12} \text{ of } 3\frac{1}{2} - (\frac{7}{8} \text{ of } \frac{3}{4} - \frac{1}{3})}{\frac{5}{14} - \frac{2}{3} \text{ of } \frac{1}{2}}$$

2. From the sum of 47·356 and 5·0397, subtract the sum of 4·52 and 3·215.

3. Find by Practice the value of 60 cwt. 3 qrs. 12 lb. at £7, 13s. 6d. per cwt.

4. A plank 12 feet long, 8 inches broad, and 1½ inches thick, weighs 60 lb.; what will be the weight of a pile of 700 planks of same wood, each 8 feet long, 10 inches broad, and 2½ inches thick?

5. An employer pays his workmen 27s. a-week when they work 9 hours a-day; what ought he to pay for 8 hours a day, if he finds that in the latter case 12 men can do as much work per hour as 13 before the change?

6. Describe the books a forester ought to keep, and their nature and use.

7. The following are the transactions in connection with Westdale Woods for the month of April 1899. From them write up the Cash-book, and show the Ledger entries for Receipts and Payments:—

April	1. Balance in bank	£600	0	0	
"	5. Received from J. Davidson, being price of pine timber sold him	250	0	0	
"	6. Received from D. Wilson for larch timber sold him	Cash	380	0	0
		Discount	20	0	0
"	7. Paid W. Thomson for young trees for nursery	Cash	76	0	0
		Discount	4	0	0
"	8. Paid J. Forbes carriage on do.		3	0	0
"	21. " W. Fisher, repairs to Fences		50	0	0
"	22. " H. Laing, Assessor, amount of assessments		12	0	0
"	30. Received from J. Cross, 1 month's rent of sawmill		10	0	0
"	" Paid pay-list for month		155	0	0
"	" Remitted proprietor		600	0	0

N.B.—All payments are made by cheque, and all sums received are paid into bank.

(An hour and a half allowed.)

DAIRY DEPARTMENT

EXAMINATION IN THE SCIENCE AND PRACTICE OF DAIRYING

This Examination, instituted in 1897, is conducted by the National Agricultural Examination Board, appointed jointly by the Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland.

REGULATIONS.

1. The Societies may hold annually in England and in Scotland, under the management of the National Agricultural Examination Board appointed by them, one or more Examinations for the National Diploma in the Science and Practice of Dairying; the Diploma to be distinguished shortly by the letters "N.D.D."

2. The Examinations will be held on dates and at places from time to time appointed and duly announced.

3. A deposit of £1 will be required from each candidate, which deposit will be returned to those who, at the first attempt, succeed in obtaining the Diploma. The Board may, at their discretion, allow an unsuccessful candidate to sit for one subsequent Examination without payment of a further deposit.

4. Forms of Entry for the Examination in England may be obtained from the Secretary of the Royal Agricultural Society of England, 13 Hanover Square, London, W., and must be returned to him duly filled up, with the deposit of £1, on or before August 31st.

5. Forms of Entry for the Examination in Scotland may be obtained from the Secretary of the Highland and Agricultural Society of Scotland, 3 George IV. Bridge, Edinburgh, and must be returned to him duly filled up, with the deposit of £1, on or before August 31st.

6. A candidate may enter for the Examination either in England or Scotland, but not in both; and a candidate who has once taken part in an Examination in England cannot enter for an Examination in Scotland, or *vice versa*.

7. A candidate will be required to satisfy the Examiners, by means of written papers, practical work, and *visd voce*, that he or she has—

- (1) A general knowledge of the management of a Dairy Farm, including the rearing and feeding of Dairy Stock, the candidate being required to satisfy the examiners that he or she has had a thorough training and practical experience in all the details of Dairy work as pursued on a farm.
- (2) A thorough acquaintance, both practical and scientific, with everything connected with the management of a Dairy, and the manufacture of Butter and Cheese.
- (3) Practical skill in Dairying, to be tested by the making of Butter and Cheese.
- (4) Capacity for imparting instruction to others.

8. The Board reserve the right to postpone, to abandon, or in any way, or at any time, to modify an Examination, and also to decline at any stage to admit any particular candidate to the Examination.

BY ORDER,

ERNEST CLARKE,

Secretary, Royal Agricultural Society of England,
13 HANOVER SQUARE, LONDON, W.

JAMES MACDONALD,

*Secretary, Highland and Agricultural Society of
Scotland,*

3 GEORGE IV. BRIDGE, EDINBURGH.

SYLLABUS OF SUBJECTS OF EXAMINATION

I.—GENERAL MANAGEMENT OF A DAIRY FARM.

1. *General Management of Pastures and Crops on a Dairy Farm.*
2. *Buildings.*—Situation, Surroundings, Construction, Ventilation, and Drainage of Farm Buildings. Suitability of building materials. Water supply. Construction and arrangements of Dairies: (a) for General Purposes; (b) for Special Purposes.
3. *Foods and Feeding.*—Summer and Winter Feeding of Dairy Cattle. Root crops. Green fodder. Ensilage. Different kinds of food and their composition. Their effect upon Milk, Butter, and Cheese. Special Foods used in Dairy Feeding. Preparation of food for Dairy Stock. Rearing and feeding of young Stock. Feeding and management of Pigs and Poultry.
4. *Dairy Cattle in Health and Disease.*—Characteristics of different Breeds, and choice of Dairy Cattle. General functions of the organs of the animal body. Breeding. Parturition. Organs which secrete milk. Process of milk secretion. Changes which food undergoes during digestion. Diseases of Dairy Cattle and their remedies.

II.—MANAGEMENT OF A DAIRY.

1. *Milk and Cream.*—Process of Milking. Dairy Utensils and Appliances, hand and power. Cooling of Milk. Separation and ripening of Cream. Different systems of Cream-raising. Utilisation of Skim-milk. Keeping of Milk. Importance of Cleanliness. Diseases spread by Milk. Conveyance and sale of Milk. Milk records. Keeping of Dairy and Farm Accounts. Creameries. Butter and Cheese Factories. Different systems of Dairying and their comparative returns.
2. *Butter.*—Churns and other Butter-making appliances, hand and power. Souring of Cream. Churning. Washing and working of Butter. Butter-milk. Packing and transmission of Butter. Salting and keeping of Butter. Colouring. Characteristics of good Butter.
3. *Cheese.*—Principles of its manufacture. Making of different kinds of Cheese (from cream, whole-milk, and skim-milk). Acidity of Milk. Use of Rennet and its substitutes. Whey. Appliances for Cheese-making. Ripening and storage of Cheese. Packing and sale of Cheese. Making of Cream and other soft Cheeses.

III.—CHEMISTRY AND BACTERIOLOGY.

General principles of Chemistry. Specific gravity: Temperature: Acidity and Alkalinity—methods and instruments for determining these. The nature and general properties of substances met with in Dairy practice.

Nature, composition, properties, and chemical constituents of Milk. Microscopical appearances. The changes which take place in Milk, and how produced. Circumstances affecting the quality and quantity of Milk. Influence of temperature. Chemical changes involved in keeping and souring of Milk and in the formation of Butter and Cheese. Taints, Fermentation, and Putrefaction. The use of Preservatives. Milk testing and analysis. Detection of adulteration in Milk, Cream, Butter, and Cheese.

Nature and functions of Bacteria. The commoner forms of Bacteria taking part in the operations of the Dairy.

IV.—PRACTICAL SKILL IN DAIRY WORK.

Candidates must be prepared—(1) to produce at or before the Examination a satisfactory certificate of proficiency in the Milking of Cows, signed by a practical Dairy Farmer; (2) to churn and make into Butter a measured quantity of Cream; and (3) to make one Cheese of each of the following varieties: (i) Hard-pressed, of not less than 30 lb.; (ii) Veined or blue moulded, of not less than 10 lb.; and (iii) also to make one or other of the following Soft Cheeses: Camembert, Coulommier, or Pont l'Évêque.

V.—CAPACITY FOR IMPARTING INSTRUCTION TO OTHERS.

Candidates must also show practically that they are familiar with the management of a Dairy, and are capable of imparting instruction to others.

EXAMINATIONS IN 1901.

ENGLAND—MONDAY, September 23, to THURSDAY, September 26, at the Reading College and British Dairy Institute, Reading; last date for receiving applications, 31st August.

SCOTLAND—MONDAY, September 30, to THURSDAY, October 3, at Kilmarnock; last date for receiving applications, 31st August.

The following obtained the Diploma in Scotland in 1900 :—

BARBOUR, JANE, Redwells, Cardenden, Fife.
DONALD, JOHN, Burrowin, Bogside, Stirling.
KINROSS, AGNES, Wester Balbeggie, Kirkcaldy.
VEITCH, JEMIMA A., Backshot, Forth, Lanarkshire.
WILKINSON, PHILIPPA, Needingworth, St Ives, Hunts.

The following obtained the Diploma in England in 1900 :—

BROWN, ERNEST CHRISTOPHER, Midland Dairy Institute, Kingston Fields, Derby.
EVANS, ELLA, Tyn-y-Coed, Sarn, Pwllheli, N. Wales.
JACKSON, EDITH MORTON, Erw Wen, Llangollen, N. Wales.
M'DUFF, MARGARET ROBERTSON, British Dairy Institute, Reading.
PERCIVAL, JOHN, Harper Fold Farm, Radcliffe, near Manchester.
STEWART, CHARLES DONALD, Yarrow Bridge, Duxbury, Chorley.

CHEMICAL DEPARTMENT

Chemist to the Society—Dr A. P. AITKEN, Chemical Laboratory,
8 Clyde Street, Edinburgh.

The object of the Chemical Department is to promote the diffusion of a knowledge of Chemistry as applied to agriculture among the members of the Society, to carry out experiments for that purpose, to assist members who are engaged in making local experiments requiring the direction or services of a chemist, to direct members in regard to the use of manures and feeding-stuffs, to assist them to put the purchase of these substances under proper control, and in general to consider all matters coming under the Society's notice in connection with the Chemistry of Agriculture.

MEMBERS' PRIVILEGES IN RESPECT OF ANALYSES.

The fees of the Chemist for analyses made for members of the Society shall, until further notice, be as follows :—

The estimation of <i>one</i> ingredient in a manure or feeding-stuff, . . .	5s.
The estimation of <i>two</i> or <i>more</i> ingredients in . . . do. . .	10s.
<i>These charges apply only to analyses made for agricultural purposes, and for the sole and private use of members of the Highland and Agricultural Society who are not engaged in the manufacture or sale of the substances analysed.</i>	

Valuations of manures, according to the Society's scale of units, will be supplied if requested.

MISCELLANEOUS.

Analysis of water ¹ to determine purity, hardness, and fitness for domestic use (not more than one analysis per year for any one member),	£1 0 0
Analysis of agricultural products—hay, grain, ensilage, roots, &c., . . .	1 0 0
Milk, full analysis,	0 10 0
" partial analysis,	0 5 0
Butter, full analysis,	0 10 0
" partial analysis (total solid and fat),	0 5 0
Cheese,	0 10 0
Limestone, giving the percentage of lime,	0 5 0
Limestone, complete analysis,	1 0 0
Analysis of soil, to determine fertility and recommendation of manurial treatment,	1 10 0
Complete analysis of soil,	2 10 0
Search for poisons in food or viscera,	2 0 0
Samples should be sent (carriage paid) to Dr A. P. Aitken, 8 Clyde Street, Edinburgh.	

INSTRUCTIONS FOR SELECTING SAMPLES FOR ANALYSIS.

MANURES.

Any method of sampling mutually agreed upon between buyer and seller may be adopted, but the following method is recommended as a very complete and satisfactory one : Four or more bags should be selected for sampling. Each bag is to be emptied out separately on a clean floor, worked through with the spade, and one spadeful taken out and set aside. The four or more spadefuls thus set aside are to be mixed together until a uniform mixture is obtained. Of this mixture one spadeful is to be taken, spread on paper, and still more thoroughly mixed, any lumps which

¹ Cases containing bottles for water samples and instructions for sampling are sent from the laboratory on application.

it may contain being broken down with the hand. Of this mixture two samples of about half a pound each should be taken by the purchaser or his agent, in the presence of the seller or his agent or two witnesses (due notice having been given to the seller of the time and place of sampling), and these samples should be taken as quickly as possible, and put into bottles or tin cases to prevent loss of moisture, and having been labelled, should be sealed by the samplers—one or more samples to be retained by the purchaser, and one to be sent to the chemist for analysis.

FEEDING-STUFFS.

Samples of feeding compounds may be taken in a similar manner.

Samples of cake should be taken by selecting three cakes, breaking each across the middle, and from the broken part breaking off a segment across the entire breadth of the cake. The three segments thus obtained should be wrapped up and sealed by the samplers, and sent for analysis as in the case of manures, and three duplicate segments similarly sealed and labelled should be retained by the purchaser.

SOILS.

Dig a little trench about two feet deep, exposing the soil and subsoil. Cut from the side of this trench vertical scrapings of the soil down to the top of the subsoil. Catch these on a clean board, and collect in this manner two pounds of soil taken from the whole surface of the section. Similar scrapings of subsoil immediately below should be taken and preserved separately. Five or six similarly drawn samples at least should be taken from different parts of the field, and kept separate while being sent to the chemist, that he may examine them individually before mixing in the laboratory.

VEGETABLE PRODUCTS.

Turnips, &c., 20 to 40 bulbs carefully selected as of fair average growth.

Hay, straw, ensilage, &c., should be sampled from a thin section cut across the whole stack or silo, and carefully mixed about; above 2 lb. weight is required for analysis.

Grain should be sampled like manures.

DAIRY PRODUCE.

Milk.—Samples of milk from individual cows should be taken direct from the milk-pail after complete milking. Average samples from a number of cows should be taken immediately after milking. Specify whether the sample is morning or evening milk, or a mixture of these in equal parts. Samples to be tested for adulteration should not be drawn from the bottom or taken from the top of standing milk, but they should be ladled from the vessel after the milk has been thoroughly mixed.

For most purposes a pint bottle of milk is a large enough sample.

Butter and Cheese.—About quarter-pound samples are required.

WATERS.

When the water is from a well, it should be pumped for some minutes before taking the sample.

If the well has been standing unused for a long time, it should be pumped for some hours, so that the water may be renewed as far as possible.

If the well has been newly dug or cleaned out, it should be pumped as dry as possible, daily, for a week before taking the sample.

Water from cisterns, tanks, ponds, &c., should be sampled by immersing the bottle entirely under the water, and holding it, neck upwards, some inches below the surface. *Water from the surface should not be allowed to enter the bottle.*

Spring or stream water should not be sampled in very wet weather, but

when the water is in ordinary condition. Such waters should be sampled by immersing the bottle, if possible; but if not deep enough for that purpose, a perfectly clean cup should be used for transferring the water to the bottle.

When the bottle has been filled the stopper should be rinsed in the water before replacing it.

Interference with or disturbance of wells or springs, or the ground in their immediate vicinity, must be carefully avoided during sampling, and for at least twenty-four hours before it.

After a sample has been taken, it should be sent to the laboratory as speedily as possible.

A description of the source and circumstances of the water should accompany the sample, as the interpretation of the analytical results depends to some extent on a knowledge of such particulars.

N.B.—Stone jars and old wine bottles are unsuitable for conveying samples. Winchester quarts chemically cleaned should be obtained from the laboratory here.

LOCAL ANALYTICAL ASSOCIATIONS.

With the view of encouraging, as well as regulating the conduct of, Local Analytical Associations, the Society, from 1881 to 1893, contributed from its funds towards their expenses a sum not exceeding £250 annually. In view of the passing of the Fertilisers and Feeding Stuffs Act, 1893, it was decided, at a meeting of the Directors on the 6th of December 1893, to discontinue that grant after the 1st of March 1894.

COMPOSITION AND CHARACTERISTICS OF MANURES AND FEEDING-STUFFS

(See '*Transactions, Fifth Series, vol. ii.* 1899.)

FORMS OF GUARANTEE

GUARANTEE OF MANURE.

I guarantee that the manure called.....and sold by me to
.....contains a minimum of—

<i>Soluble phosphoric acid</i>	= Phosphate of lime dissolved	... per cent.
<i>Insoluble phosphoric acid</i>	= Phosphate of lime undissolved	... per cent.
<i>Potash salts</i>	= Potash (K_2O)	... per cent.
<i>Total nitrogen</i>	= Ammonia	... per cent.

Signature of seller.....

Date... ..19...

GUARANTEE OF FEEDING-STUFF.

I guarantee that the feeding-stuff called.....and sold by me to
.....contains a minimum of—

.....	per cent albuminoids.
.....	per cent oil.
.....	per cent carbohydrates.

Signature of seller.....

Date19 ..

UNITS TO BE USED IN DETERMINING THE COMMERCIAL VALUE OF MANURES.¹

Terms—CASH, including Bags gross weight—not including Carriage.

N.B.—These units are based on the RETAIL PRICES at the following seaports: Berwick, Leith, Bo'ness, Dundee, and Glasgow. When these units are multiplied by the percentages in the analysis of a Manure, they will produce a value representing very nearly the cash price at which TWO TONS may be bought in fine sowing condition. Larger purchases may be made on more favourable terms, but for smaller purchases an extra charge of 1s. 6d. per ton is made.

FOR SEASON 1901.

CASH PRICES AS FIXED ON 6TH FEBRUARY.

Items to be Valued.	Peruvian (Riddled).		Bone-Meal.	Steamed Bone Flour.	Dissolved or Vitriolated Bones.	Superphosphates.	
	Ammoniacal.	Phosphatic.				30% Sol. Phos. or under.	Over 30% Sol. Phos.
	P. unit	P. unit	P. unit	P. unit	P. unit.	P. unit.	P. unit.
Phosphates dissolved	1/6	1/4	{ ..	{ ..	3/-	1/11	1/10
" undissolved					1/3	..	..
Nitrogen	16/5	15/-	11/-	11/-	12/-	..	..
or Ammonia	13/6	12/6	9/-	9/-	10/-	..	..
Prices per ton, Feb. 6, 1901—							
From	160/-	105/-	90/-	80/-	100/-	45/-	55/-
To	200/-	120/-	100/-	90/-	165/-	55/-	65/-

	Guarantee.	Price per Ton.		Unit.
		Per cent.	£ s d.	
Sulphate of ammonia ² . . . ex ship	24	Ammonia	11 10 0	Am. =
Nitrate of soda, 95 per cent ² "	19	"	8 15 0	" = 9
Muriate of potash, 80 per cent "	50	Potash	8 15 0	Pot. = 3/6
Sulphate of potash, 50 per cent "	27	"	5 0 0	" = 3/9
Kainit	12	"	2 0 0	" = 3/4
Potash salts	30	"	4 12 6	" = 3/1
Thomas-slag phosphate	80	Phosphate	1 15 0	Phos. = 1/2
" "	38	"	2 0 0	" = 1/-

¹ Instructions regarding units and the valuation of manures are given on p. 33.

² These are the February prices, but they are subject to variation from month to month or oftener.

FEEDING-STUFFS.				Price per Ton in bags.
	Average Analyses.			
	Album.	Oil.	Carbo- hydrates.	
Linseed-cake	28	9	35	£ s. d. 8 10 0
" Canadian	28	8	35	7 12 6
Decorticated cotton-cake	45	10	20	6 15 0
Undecorticated do.	24	7	25	5 5 0
Bean-meal ¹	25	2	50	7 4 0
Locust-bean meal	6	2	70	6 0 0
Dried Distillery grains	20	8	50	5 5 0
Barley bran	15	5	50	5 5 0
Indian corn ¹	10	5	55	4 10 0
Paisley meal	15	9	60	5 0 0
Linseed (whole)	20	35	14	15 10 0
Linseed oil . . . . .	..	..	.	24 0 0
Treacle . . . . .	..	..	.	4 15 6

¹ These are the February prices, but they are subject to variation from month to month or oftener.

CLASSIFICATION OF MANURES.

Bone-meal	{	Genuine bone-meal contains from 48 per cent to 55 per cent phosphates, and from 4 per cent to 5 per cent ammonia. If phosphates are low ammonia will be high, and conversely.
Steamed bone-flour	{	Ground to flour and containing about 60 to 65 per cent phosphates, and about 1½ to 2½ per cent ammonia
Dissolved bones	{	Must be pure—i.e., containing nothing but natural bones and sulphuric acid.
Mixtures	{	To be valued according to the unit values (as given above) of the ingredients of which they are guaranteed <i>and also found</i> to be composed, with an addition of from 5 to 10 per cent, according to the excellence of their manufacture.
Thomas-slag	{	Fineness of grinding is of paramount importance. The coarsest kind used should be so finely ground that 80 per cent passes through a sieve of 10,000 holes per sq. inch.

INSTRUCTIONS FOR VALUING MANURES.

The unit used for the valuation of manures is the hundredth part of a ton, and as the analyses of manures are expressed in parts per hundred, the percentage of any ingredient of a manure when multiplied by the price of the unit of that ingredient represents the value of the quantity of it contained in a ton.

As an example take muriate of potash—a good sample (see p. 31) will be guaranteed to contain 80 per cent *pure* muriate of potash; the other 20 per cent consisting of unimportant impurities such as common salt. But all potash manures are valued according to the amount of Potash they yield, and 80 per cent of pure muriate of potash yields 50 per cent potash (K_2O)—*i.e.*, 50 units per ton, and as a ton of muriate of potash costs £8, 15s. the price of the unit is the fiftieth part of that—*viz.*, 3s. 6d. If on analysis a sample of muriate of potash guaranteed to contain 50 per cent of potash is found to contain only 49 per cent, the price per ton will be 3s. 6d. less—*viz.*, £8, 11s. 6d.

Similarly with all other manures the price per unit is derived from the price per ton of a sample of good material up to its guarantee, and therefore the proper price per ton of a manure is found by multiplying the price of the unit of the valuable ingredient by the percentage as found by analysis. If a manure contains more than one valuable ingredient the unit value of each ingredient is multiplied by its percentage, and the values so found when added together give approximately the price per ton of the manure.

Nitrate of soda contains no ammonia but it contains nitrogen, and 14 units of nitrogen are equivalent to 17 units of ammonia, and it is the custom in Scotland to value all nitrogenous manures not according to the nitrogen they contain but according to its equivalent of ammonia.

The commercial values of manures are determined by means of the following manner:—

Take the analysis of the manure, and look for the following substances:—

Phosphates dissolved (or soluble phosphate)	} No other items but these are to be valued.
" undissolved (or insoluble ")	
Nitrogen = Ammonia	
Potash	

Should the analysis or the guarantee not be expressed in that way, the chemist or the seller should be asked to state the quantities in these terms.

Suppose the manure is bone-meal:—

An ordinary bone-meal will contain about 50 per cent phosphate and nearly 4 per cent ammonia. The units for bone-meal are 1s. 2d. for phosphate and 9s. for ammonia. Therefore the value is—

Insol. phosphate, 50 times 1s. 2d., equal to	£2 18 4
Nitrogen = Ammonia, $4\frac{1}{2}$ times 9s., equal to	2 0 6

Say £4 19 0 per ton.

Suppose the manure is dissolved or vitriolated bones:—

It must be guaranteed "pure."

The units in the Schedule are 3s. for soluble phosphate, 1s. 3d. for insoluble phosphate, and 10s. for ammonia.

The analysis will be about 16 per cent soluble phosphate, 20 per cent insoluble phosphate, and 3 per cent ammonia. In that case the value would be—

Sol. phosphate,	16 times 3s.,	equal to	£2 8 0
Insol. „	20 „ 1s. 3d.,	„	1 5 0
Nitrogen = Ammonia, 3	„ 10s.,	„	1 10 0
			Say £5 3 0 per ton.

Suppose the manure is a superphosphate,—say an ordinary superphosphate, with 28 per cent soluble phosphate and 3 per cent insoluble phosphate. It is valued thus:—

Sol. phosphate, 28 times 1s. 11d., equal to, say, £2, 13s. 8d. per ton.
Insoluble phosphate is not valued in a superphosphate.

Note.—The units have reference solely to the COMMERCIAL VALUES of Manures, and not to their AGRICULTURAL VALUES.

Thus, in stating soluble phosphate in dissolved bones at 3s. per unit, and that in superphosphate at 1s. 10d., it is meant that these are the prices per unit at which soluble phosphate can be bought in these two manures; but it does not mean that the soluble phosphate in the one is 1s. 2d. per unit better as a manure than that in the other. It is probably no better.

BOTANICAL DEPARTMENT

Consulting Botanist to the Society—A. N. M'ALPINE,
 6 Blythswood Square, Glasgow.

The Society have fixed the following rates of charge for the examination of plants and seeds for the *bona fide* and individual use and information of members of the Society (not being seedsmen), who are particularly requested, when applying to the Consulting Botanist, to mention the kind of examination they require, and to quote its number in the subjoined schedule. The charge for examination must be paid at the time of application, and the carriage of all parcels must be prepaid.

Scale of Charges.

1. A report on the purity, amount, and nature of foreign materials, 2s.
2. On the germinating power of a sample of seed, 2s.
3. Determination of the species of any weed or other plant, or of any vegetable parasite, with a report on its habits and the means for its extermination or prevention, 5s.
4. Report on any disease affecting farm crops, 5s.
5. Determination of the species of any natural grass or fodder plant, with a report on its habits and pasture or feeding value, 1s.

The Consulting Botanist's Reports are furnished to enable members—purchasers of seeds and corn for agricultural purposes—to test the value of what they buy, and are not to be used or made available for advertising or trade purposes by seedsmen or otherwise.

Instructions for Selecting and Sending Samples.

In sending seed or corn for examination, the utmost care must be taken to secure a fair and honest sample. In the case of grass seeds, the sample would be drawn from the centre of the sack or bag, and in all cases from the bulk delivered to the purchaser. If anything supposed to be

injurious or useless exists in the corn or seed selected, samples should also be sent.

When possible, at least one ounce of grass and other small seeds should be sent, and two ounces of cereals or larger seeds. The exact name under which the seed has been bought (but preferably, a copy of the invoice) should accompany the sample.

Grass seeds should be sent at least four weeks, and clover seeds three weeks, before they are to be used.

In collecting specimens of plants, the whole plant should be taken up and the earth shaken from the roots. If possible, the plants must be in flower or fruit. They should be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. Place them in a bottle, or pack them in tinfoil or oil-silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which, in the opinion of the sender, would be likely to throw light on the inquiry.

It is strongly recommended that members purchasing seeds should insist—

(1) Upon having from the seller a guarantee stating the purity and germination of the seed supplied.

(2) That the bulk be same as sample.

(3) That it contain not more than 5 per cent other than the species ordered.

If the purity and germination of the seed is not known, it is impossible to tell either its money value or the proper amount to be sown.

It is also strongly recommended that the purchase of prepared mixtures should be avoided, and the different seeds to be used should be purchased separately.

Parcels or letters containing seeds or plants for examination (carriage or postage paid) must be addressed to Professor M'Alpine, Botanical Laboratory, 60 John Street, Glasgow.

INSECT PESTS.

Arrangements have been made with Mr R. Stewart MacDougall, M.A., D.Sc., Edinburgh, to advise members of the Society regarding insects or allied animals which, in any stage of their development, infest—

- | | |
|-----------------------------------|-------------------------------------|
| (a) Farm crops. | (d) Fruit and fruit trees. |
| (b) Stored grain. | (e) Forest trees and stored timber. |
| (c) Garden and greenhouse plants. | (f) Live stock (including poultry). |

Members consulting Mr MacDougall will please forward with their queries examples of the injured plants, or the injured parts of plants, &c., as well as specimens of the insects or other animals believed to be the cause of the injury.

Specimens should be sent in tin or wooden boxes, or in quills, to prevent injury in transmission.

Address letters and parcels (carriage or postage paid) to R. Stewart MacDougall, 13 Archibald Place, Edinburgh.

The Directors have fixed the fee payable by members to Mr MacDougall at 1s. for each case upon which he is consulted; this fee must be sent to him along with the application for information.

PREMIUMS

GENERAL REGULATIONS FOR COMPETITORS.

1. It is to be distinctly understood that the Society is not responsible for the views, statements, or opinions of any of the writers whose papers are published in the 'Transactions.'

2. All reports must be legibly written, and on one side of the paper only; they must specify the number and subject of the Premium for which they are in competition; they must bear a distinguishing motto, and be accompanied by a sealed letter, similarly marked, containing the name and address of the reporter—initials must not be used.

3. No sealed letter, unless belonging to a report found entitled to the Premium offered, or a portion of it, will be opened without the author's consent.

4. Reports for which a Premium, or a portion of a Premium, has been awarded, become the property of the Society, and cannot be published in whole or in part, nor circulated in any manner, without the consent of the Directors. All other papers will be returned to the authors if applied for within twelve months.

5. The Society is not bound to award the whole or any part of a Premium.

6. All reports must be of a practical character, containing the results of the writer's own observation or experiment, and the special conditions attached to each Premium must be strictly fulfilled. General essays, and papers compiled from books, will not be rewarded or accepted. Weights and measurements must be indicated by the imperial standards.

7. The Directors, before or after awarding a Premium, shall have power to require the writer of any report to verify the statements made in it.

8. The decisions of the Board of Directors are final and conclusive as to all matters relating to Premiums, whether for Reports or at General or District Shows; and it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

9. The Directors will welcome papers from any Contributor on any suitable subject not included in the Premium List; and if the topic and the treatment of it are both approved, the writer may be remunerated and his paper published.

CLASS I.

REPORTS.

SECTION 1.—THE SCIENCE AND PRACTICE OF
AGRICULTURE.

FOR APPROVED REPORTS.

1. On any useful practice in Rural Economy adopted in other countries, and susceptible of being introduced with advantage into Scotland—The Gold Medal. To be lodged by 1st November in any year.

The purposes chiefly contemplated by the offer of this premium is to induce travellers to notice and record such particular practices as may seem calculated to benefit Scotland. The Report to be founded on personal observation.

2. Approved Reports on other suitable subjects. To be lodged by 1st November in any year.

SECTION 2.—ESTATE IMPROVEMENTS.

FOR APPROVED REPORTS.

1. By the Proprietor in Scotland who shall have executed the most judicious, successful, and extensive Improvement—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

Should the successful Report be written for the Proprietor by his resident factor or farm manager, a Minor Gold Medal will be awarded to the writer in addition to the Gold Medal to the Proprietor.

The merits of the Report will not be determined so much by the mere extent of the improvements, as by their character and relation to the size of the property. The improvements may comprise reclaiming, draining, enclosing, planting, road-making, building, and all other operations proper to landed estates. The period within which the operations may have been conducted is not limited, except that it must not exceed the term of the Reporter's proprietorship.

2. By the Proprietor or Tenant in Scotland who shall have reclaimed within the ten preceding years not less than forty acres of Waste Land—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

3. By the Tenant in Scotland who shall have reclaimed within the ten preceding years not less than twenty acres of Waste Land

—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

4. By the Tenant in Scotland who shall have reclaimed not less than ten acres within a similar period—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November in any year.

The Reports in competition for Nos. 3, 4, and 5 may comprehend such general observations on the improvement of waste lands as the writer's experience may lead him to make, but must refer especially to the lands reclaimed—to the nature of the soil—the previous state and probable value of the subject—the obstacles opposed to its improvement—the details of the various operations—the mode of cultivation adopted—and the produce and value of the crops produced. As the required extent cannot be made up of different patches of land, the improvement must have relation to one subject; it must be of profitable character, and a rotation of crops must have been concluded before the date of the Report. *A detailed statement of the expenditure and return and a certified measurement of the ground are requisite.*

5. By the Proprietor or Tenant in Scotland who shall have improved within the ten preceding years the Pasturage of not less than thirty acres, by means of top-dressing, draining, or otherwise, without tillage, in situations where tillage may be inexpedient—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

6. By the Tenant in Scotland who shall have improved not less than ten acres within a similar period—The Minor Gold Medal. To be lodged by 1st November in any year.

Reports in competition for Nos. 5 and 6 must state the particular mode of management adopted, the substances applied, the elevation and nature of the soil, its previous natural products, and the changes produced.

SECTION 3.—HIGHLAND INDUSTRIES AND FISHERIES.

FOR APPROVED REPORTS.

1. The best mode of treating native Wool; cleaning, carding, dyeing, spinning, knitting, and weaving by hand in the Highlands and Islands of Scotland—Five Sovereigns. To be lodged by 1st November 1901.

SECTION 4.—MACHINERY.

FOR APPROVED REPORTS.

To be lodged by 1st November in any year.

SECTION 5.—FORESTRY DEPARTMENT.

FOR APPROVED REPORTS.

1. On Plantations of not less than eight years' standing formed on deep peat-bog—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1901.

The premium is strictly applicable to deep peat or flow moss ; the condition of the moss previous to planting, as well as at the date of the Report, should, if possible, be stated.

The Report must describe the mode and extent of the drainage, and the effect it has had in subsiding the moss—the trenching, levelling, or other preliminary operations that may have been performed on the surface—the mode of planting—kinds, sizes, and number of trees planted per acre—and their relative progress and value, as compared with plantations of a similar age and description grown on other soils in the vicinity.

CLASS II.

DISTRICT COMPETITIONS.

REGULATIONS 1901.

As to payment of Grants, see Regulation 10, Section 1.

Grants in aid of DISTRICT COMPETITIONS for 1902 must be applied for before 1st November 1901, on Forms to be obtained from the Secretary.

When a Grant has expired, the District cannot apply again for aid for two years.

SECTION I.—GRANTS TO DISTRICT SOCIETIES FOR HORSES, CATTLE, SHEEP, AND PIGS.

1. CLASS OF STOCK—LIMIT OF GRANTS, £340.—The Highland and Agricultural Society will make Grants to District Societies to deal with, as in the opinion of the District Societies the need of each district may require, for such classes of breeding Stock of Horses, Cattle, Sheep, and Pigs as are embraced in the General Show Prize List of the Highland and Agricultural Society. The total sum to be expended by the Highland and Agricultural Society in such Grants shall not exceed the sum of £340 in any one year.

2. GRANT TO DISTRICT, £12.—The portion of the Grant to any one District Society shall not exceed the sum of £12 in any one year.

3. CONTINUANCE OF GRANT THREE YEARS—ADVERTISING.—The Grant shall continue for three alternate years, provided always that the District

Society shall, in the two intermediate years, continue the competition by offering Premiums equal in amount to not less than one-half the sum given by the Highland and Agricultural Society, and for the same class of Stock as that selected in each previous year to compete for the Highland and Agricultural Society's Prizes. The Prizes when given by the Highland and Agricultural Society must be announced as the Society's gift. If no competition takes place for two years the Grant expires.

4. When it is agreed to hold the General Show of the Society in any district, no provincial show shall be held in that district in the months of June, July, or August.

5. MEDALS.—In the two alternate years the Highland and Agricultural Society will place three Silver Medals at the disposal of the District Societies, for the same classes of Stock as those for which the Money Premiums are offered, provided that not less than three lots are exhibited in the same class.

6. RULES OF COMPETITION.—The Rules of Competition for the Premiums, the Funds for which are derived from Grants of the Highland and Agricultural Society, shall be such as are generally enforced by the Society receiving the Grant for Premiums offered by itself.

7. AREA AND PARISHES.—FIVE PARISHES.—When making application for Grants from the Highland and Agricultural Society, the District Society must delineate the area and the number of parishes comprised in the district, and, *except in special cases*, no District Society shall be entitled to a Grant whose show is not open to at least five Parishes.

8. NOMINATION OF MEMBERS.—The Directors may nominate one or more members of the Highland and Agricultural Society resident in the district, whose duty it shall be to see that the conditions imposed by the Board are complied with.

9. REPORTS.—Blank Reports will be furnished to the Secretaries of the different District Societies. These Reports must in all details be completed and lodged with the Secretary of the Highland and Agricultural Society on or before the 1st of November next following the competition, both in the years when the Grant is given and in the two intermediate years, for the approval of the Directors of the Highland and Agricultural Society, against whose decision there shall be no appeal. All such Reports must be signed and certified by the Members of the Highland and Agricultural Society nominated under Rule 8.

10. GRANTS—WHEN PAID.—The Grants made to District Societies will be paid as soon as practicable after the Reports of the awards of the prizes have been received and found to be in order and passed by the Board of Directors, the Money Grants being paid to the Secretaries of the Local Societies and the Medals sent direct to the winners. The Secretary of the District Society must not on any condition whatever pay any premium offered by the Highland and Agricultural Society until he has been informed that the awards are in order and has received the grant from the Highland and Agricultural Society.

11. RENEWAL OF APPLICATION.—No application for renewal of a Grant to a District Society will be entertained until the expiration of *two years* from the termination of the last Grant.

12. DISPOSAL OF APPLICATIONS.—In disposing of applications for District Grants, the Directors of the Highland and Agricultural Society shall keep in view the length of interval that has elapsed since the expiration of the last Grant, giving priority to those District Societies which have been longest off the list.

13. DAIRY PRODUCE.—Upon application being made by District Societies, a limited number of Medals will be placed at the disposal of District Societies for Dairy Produce.

DISTRICTS.

1. NITHSDALE.—*Convener*, William Barber, Tererran, Moniaive; *Secretary*, Robert Wilson, Solicitor, Thornhill. Granted 1897.
2. KIRRIEMUIR.—*Convener*, T. M. Nicoll, Littleton, Kirriemuir; *Secretary*, Stewart Lindsay, Crawford Park, Kirriemuir. Granted 1897.
3. BREADALBANE.—*Convener*, Thomas Watters, Glenample, Lochearnhead; *Secretary*, Duncan Campbell, Dundarrah, Killin. Granted 1898. (In abeyance in 1900 on account of the Stirling Show.)
4. WEST OF SCOTLAND UNION.—*Convener and Secretary*, John Watson, National Bank, Crosshill, Glasgow. Granted 1899.
5. LAMMERMOOR PASTORAL.—*Convener*, Richard Stephenson, Chapel, Duns; *Secretary*, William Weatherhead, Preston, Duns. Granted 1899.
6. STRATHBOGIE.—*Convener*, James Davidson, Newton Cairnie, Huntly; *Secretary*, Francis E. Watt, Town and County Bank, Limited, Huntly. Granted 1901.
7. ISLAY, JURA, AND COLONSAY.—*Convener*, John Laughton, Ellabus, Islay; *Secretary*, Robert Cullen, Solicitor, Bridgend, Islay. Granted 1901.
8. ARRAN.—*Convener*, Patrick Murray, Strabane, Brodick; *Secretary*, William Tod, jun., Glenlee, Lamblash. Granted 1901.
9. DUMFRIES.—*Convener*, W. J. Herries Maxwell of Munches, M.P., Dalbeattie; *Secretary*, John Blacklock, Solicitor, Dumfries. Granted 1901.
10. DOUNE.—*Convener*, James McLachlan, Doune Lodge, Doune; *Secretary*, James Murray, Powblack, Kippen Station. Granted 1901.
11. INVERURIE.—*Convener*, John Tait, (Richie, Inverurie; *Secretary*, John Low, Union Bank of Scotland, Limited, Inverurie. Granted 1898.
12. KINTYRE.—*Convener*, Com. D. Stewart, R.N., Knockrioch, Campbeltown; *Secretary*, G. Erskine Inglis, Campbeltown. Granted 1898.
13. ST MARY'S ISLE ESTATES AND DISTRICT.—*Convener*, Col. Robt. F. Dudgeon, The Grange, Kirkcubright; *Secretary*, John Gibson, Solicitor, Kirkcubright. Granted 1898.
14. CARNWATH.—*Convener*, R. J. Logan of New Mains, Carnwath; *Secretary*, John Robertson, Banker, Carnwath. Granted 1898.
15. STRANRAER AND RHINS OF GALLOWAY.—*Convener and Secretary*, John Bennoch, Solicitor, Stranraer. Granted 1898.
16. STIRLING.—*Convener*, James M'Farlane of Oxhill, Bucklyvie; *Secretary*, Andrew C. Buchanan, 26 Port Street, Stirling. Granted 1899. (In abeyance in 1900 on account of the Stirling Show.)
17. FORMARTINE.—*Convener*, David Walker, Coullie, Udney, Aberdeen; *Secretary*, Thos. H. Gibson, Cultercullen, Aberdeen. Granted 1900.
18. DUNOON.—*Convener*, John Mercer, Ardnadam, Sandbank; *Secretary*, John Dobie, Clydesdale Bank, Dunoon. Granted 1900.
19. GIRVAN.—*Convener*, Robert Inglis, Lovestone, Girvan; *Secretary*, Andrew Dunlop, Royal Bank, Girvan. Granted 1900.
20. MOFFAT AND UPPER ANNANDALE.—*Convener*, James Johnstone, Hunterheck, Moffat; *Joint-Secretaries*, John Young, Michael Johnstone, and William Tait, Moffat. Granted 1900.
21. GLENKENS.—*Convener*, Colonel J. M. Kennedy of Knocknarling, Dalry, Galloway; *Secretary*, James M'Gill, New Galloway. Granted 1900.
22. EAST KILBRIDE.—*Convener*, James M'Meeken, Carnboth, Busby; *Secretary*, William Strang, 103 West Regent Street, Glasgow. Granted 1900.

23. **ATHOLL AND WEEM.**—*Convener*, Alex. Robertson, Ballechin, Ballinluig; *Secretary*, Hugh Mitchell, Pitlochry. Granted 1900.
24. **LOWER WARD OF RENFREWSHIRE.**—*Convener*, H. R. B. Peile, Mansion House, Greenock; *Secretary*, Robert Steuart Walker, 11 William Street, Greenock. Granted 1900.
25. **WESTER ROSS.**—*Convener*, P. B. Macintyre, Mains of Findon, Conon Bridge; *Secretary*, Ben. Aird, Banker, Dingwall. Granted 1898. (In abeyance in 1901 on account of the Inverness Show.)
26. **SUTHERLAND.**—*Convener*, Donald M'Lean, Sutherland Estate Offices, Golspie; *Secretary*, J. Mackintosh, Proney, Dornoch. Granted 1897. (In abeyance in 1901 on account of the Inverness Show.)

In 1901.

Nos. 1 and 2 are in competition for the last year.

Nos. 3, 4, and 5 are in competition for the second year.

Nos. 6, 7, 8, 9, and 10 are in competition for the first year.

Nos. 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, and 24 compete for local Premiums.

Nos. 25 and 26 are in abeyance on account of the Inverness Show.

SECTION 2.—GRANTS TO HORSE ASSOCIATIONS, &c., FOR STALLIONS FOR AGRICULTURAL PURPOSES.

1. **HORSES—LIMIT OF GRANT, £210.**—The Highland and Agricultural Society will make Grants to Horse Associations and other Societies in different districts engaging Stallions for agricultural purposes. The total sum expended by the Highland and Agricultural Society in such Grants shall not exceed the sum of £210 in any one year.

2. **GRANT TO EACH, £15.**—The portion of the Grant to any one Horse Association, &c., shall not exceed the sum of £15 in any one year.

3. **CONTINUANCE OF GRANT THREE YEARS—INTERMEDIATE YEAR.**—The Grant shall continue for three alternate years, provided always that the Horse Association or Society shall, in the two intermediate years, offer at least a sum equal in amount to that granted by the Highland and Agricultural Society for the hire of a Horse in connection with the Association or Society to whom the Grant is made.

4. **NOMINATION OF MEMBERS.**—The Directors of the Highland and Agricultural Society shall nominate one or more members of the Highland and Agricultural Society, resident in the Districts in which the Society benefited is located, whose duty it shall be to see that the conditions imposed by the Board are complied with.

5. **REPORTS—PENALTY FOR NOT ENGAGING HORSE.**—No Grant by the Highland and Agricultural Society to Horse Associations, &c., will be paid unless a report, signed and certified by the members appointed under Rule 4, be furnished to the Highland and Agricultural Society not later than the 1st of November in each year in which the Grant is made, and also in the alternate years, stating that a Horse has been engaged by the Horse Association or other Society to whom the Grant is made; and in the event of a Horse not being engaged in any one year while the provisions of the Grant are in force, the Grant made by the Highland and Agricultural Society will cease.

6. **RULES 10 (Time of Payment), 11 (Renewal of Grant), and 12 (Disposal of Applications)** applicable to Section 1, shall be applicable to Section 2.

DISTRICTS.

1. WEST FIFE CLYDESDALE HORSE SOCIETY.—*Convener*, James Law, Spencerfield, Inverkeithing; *Secretary*, James Millar, Waulkmill, Dunfermline. Granted 1897.
2. CARSE OF GOWRIE AND DUNDEE DISTRICT STALLION SOCIETY.—*Convener*, Capt. Clayhills Henderson of Invergowrie, R.N., Dundee; *Secretary*, Alex. Anderson, Berryhill, Dundee. Granted 1897.
3. KILFINAN.—*Convener*, Duncan Thomson, Inveryne, Tighnabruaich; *Secretary*, Neil Nicolson, Auchgoyle, Tighnabruaich. Granted 1899.
4. FYVIE.—*Convener*, James Durno, Eastertown, Old Meldrum; *Secretary*, John Hay, Mill of Crichtie, Fyvie. Granted 1899.
5. KINROSS-SHIRE.—*Convener*,
; *Secretary*, John Hay, Swansacre, Kinross. Granted 1899.
6. GLENKENS, BALMAGHIE, AND PARTON.—*Convener*, W. A. M'Turk, Barlae, Dalry, Galloway; *Secretary*, Robt. T. Scott, Drumhumphey, Corsock, Dalbeattie. Granted 1899.
7. MACHARS.—*Convener*, William Smith, Garrarie, Portwilliam; *Secretary*, Charles M. Routledge, British Linen Co. Bank, Portwilliam. Granted 1899.
8. POLTALLOCH.—*Convener*, R. A. Meikle, Ri-cruin, Lochgilphead; *Secretary*, Arch. Taylor, Ri-cruin, Lochgilphead. Granted 1901.
9. SIEYSDALE CLYDESDALE HORSE-BREEDING SOCIETY.—*Convener*, Colonel John Gordon Smith of Delnabo, Glenlivet; *Secretary*, A. R. Stuart, Inverfiddich, Craigellachie. Granted 1901.
10. ATHOLL AND BREADALBANE.—*Convener and Secretary*, James J. Gillespie, St Colmes, Ballinluig. Granted 1901.
11. DUMBARTONSHIRE HORSE-BREEDING SOCIETY.—*Convener*, Charles W. Ralston, Garscube, Maryhill; *Secretary*, William Reid, 140 St Vincent Street, Glasgow. Granted 1898.
12. SELKIRK AND GALASHIELS.—*Convener*, John Dun, Craigpark, Galashiels; *Secretary*, David C. Finlay, Elm Cottage, Galashiels. Granted 1898.
13. NAIRNSHIRE.—*Convener*, A. T. Donaldson, Banker, Nairn; *Secretary*, J. A. Robertson, Royal Stables, Nairn. Granted 1900.
14. NEWTON-STEWART HORSE-BREEDING SOCIETY.—*Convener*, William Baird, Kirvennie, Wigtown; *Secretary*, John McConchie, Carse-willoch, Creetown. Granted 1900.

In 1901.

Nos. 1 and 2 are in competition for the last year.

Nos. 3, 4, 5, 6, and 7 are in competition for the second year.

Nos. 8, 9, and 10 are in competition for the first year.

Nos. 11, 12, 13, and 14 compete for local premiums.

DAIRY PRODUCE.

Upon application being made by District Societies, a limited number of Silver Medals will be placed at the disposal of District Societies for Dairy Produce.

The Medals are granted for two years, and lapse if not awarded in those years.

GALLOWAY DAIRY PRODUCE SHOW.—*Convener*, Sir Mark J. M'Taggart Stewart, Bart., M.P., Ardwell, Wigtownshire; *Secretary*, Patrick Gifford, Solicitor, Castle Douglas. 2 Medals. 1901.

SPECIAL GRANTS.

- £40 to the Highland Home Industries Association.—*Joint-Secretaries*, Miss Muriel K. Mackenzie, Conon House, Conon Bridge, Ross-shire, and Miss Ross, Riverfield, Inverness. (Granted 1895. (Did not hold a Competition in 1899 or 1900.)
- £20 to the Ayrshire Agricultural Association, to be competed for at the Dairy Produce Show at Kilmarnock.—*Convener*, The Hon. G. R. Vernon, Auchans House, Kilmarnock; *Secretary*, John Howie, Wellington Chambers, Ayr. Granted 1872.
- £5 to Shetland Agricultural Society.—*Convener*, John Bruce of Sumburgh, Lerwick; *Secretary*, J. Wilson, Commercial Bank, Lerwick. Granted 1893.
- £3 to Orkney.—*Secretary*, James Johnston, Orphir House, Orkney. Granted 1883.
- £3 to East Mainland, Orkney.—*Convener*, Alfred Reid, Braebuster, Kirkwall; *Secretary*, John Cumming, Selby, St Andrews, Orkney. Granted 1898.
- £3 to West Mainland, Orkney.—*Convener*, W. G. T. Watt, Skail House, Stromness; *Secretary*, Robert Gibson, Lochside, Stenness, Stromness. Granted 1900.
- North of Scotland Root, Vegetable, &c.—*Convener*, John Maitland, East Balhalgardy, Inverurie; *Secretary*, James Eddie, Freefield, Inch. 4 Medals. Granted 1899.
- Glasgow and West of Scotland Horticultural Society.—*Secretary*, Hugh M. Mackie, C.A., 55 Bath Street, Glasgow. 6 large Silver Medals for their show in connection with the Glasgow Exhibition of 1901. Granted for 1901 only.

MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

The Society, being anxious to co-operate with local Associations, will give a limited number of Silver Medals annually to Societies, not on the list of Cattle, Horse, or Sheep Premiums, in addition to the Money Premiums awarded in the Districts for—

1. Best Bull, Cow, Heifer of any pure breed, or Ox.
2. Best Stallion, Mare, or Gelding.
3. Best Tup, or Pen of Ewes or Wethers.
4. Best Boar, Sow, or Pig.
5. Best Pens of Poultry.
6. Best Sample of any variety of Wool.
7. Best Sample of any variety of Seeds.
8. Best managed Farm.
9. Best managed Green Crop.
10. Best managed Hay Crop.
11. Best managed Dairy.
12. Best Sweet-Milk Cheese.
13. Best Cured Butter.
14. Best collection of Roots.
15. Best kept Fences.

16. Male Farm Servant who has been longest in the same service, and who has proved himself most efficient in his duties, and to have invariably treated the animals under his charge with kindness.
17. Female Servant in charge of Dairy and Poultry who has been longest in the same service, and who has proved herself most efficient in her duties, and to have invariably treated the animals under her charge with kindness.
18. Best Sheep-Shearer.
19. Most expert Hedge-Cutter.
20. Most expert Labourer at Draining.
21. Most expert Farm Servant at trial of Reaping-Machines.
22. Best Maker of Oat-Cakes.

It is left to the local Society to choose out of the foregoing list the classes for which the Medals are to be competed.

The Medals are granted for two years, and lapse if not awarded in those years.

In 1889 it was resolved that in future no Society shall receive more than two Medals for two years.

Aberdeenshire.

1. CLUNY, MONYMUSK, AND MIDMAR.—*Convener*, Ranald Macdonald, Cluny Castle, Aberdeen; *Secretary*, James Christie, Backhill, Cluny, Kemnay. 2 Medals. 1900.
2. CROMAR, UPPER DEE, AND DONSIDER.—*Convener*, Sir John Forbes Clark, Bart., Tillypronie, Tarland; *Secretary*, William Thomson, Town and County Bank, Tarland. 2 Medals. 1901.
3. DEESIDE UNION.—*Convener*, Lt.-Col. F. N. Innes of Learney, Torphins, Aberdeen; *Joint-Secretaries*, John Davidson, Harestone, Banchory, and John Cooper, Ley, Banchory. 2 Medals. 1900.
4. MAR.—*Convener*, George Still, Strathray, Kinaldie; *Secretary*, Sylvester Campbell, Kinellai, Kinaldie. 2 Medals. 1900.
5. UPPER DONSIDER.—*Convener*, James M'Donald, Mossat, Kildrummy; *Secretary*, John Milne, Mossat, Kildrummy. 2 Medals. 1901.
6. STRICHEN.—*Convener and Secretary*, John Sleigh, Strichen Mains, Strichen. 2 Medals. 1900.
7. TURRIFF.—*Convener*, Alex Stuart, Laithers House, Turriff; *Secretary*, R. Cruickshank, Claymires, Turriff. 2 Medals. 1900.

Argyllshire.

8. OBAN POULTRY CLUB.—*Convener*,
Secretary, James D. MacTaggart, Glenmore, Oban. 2 Medals. 1901. (In abeyance in 1901.)

Ayrshire.

9. COLMONELL AND BALANTRAE.—*Convener*,
; *Secretary*, Andrew M'Cledie, Union Bank, Barrhill. 2 Medals. 1901.
10. MONKTON, NEWTON, PRESTWICK, AND ST QUIVOX.—*Convener*, Thomas Howie, Fairfield Mains, Monkton; *Secretary*, John Meikle, Aitkenbrae Cottage, Monkton. 2 Medals. 1900.
11. PATNA.—*Convener*, Robert Lees, Lagg, Ayr; *Secretary*, William Dunn, Hoodstone, Patna. 2 Medals. 1900.

Dumfries-shire.

12. SANQUHAR.—*Convener*, James Wightman, South Mains, Sanquhar ; *Secretary*, William Murray, British Linen Co. Bank, Sanquhar. 2 Medals. 1900. (In abeyance in 1900.)

Stewartry of Kirkcudbright.

13. DALRY HORTICULTURAL BIRD AND POULTRY.—*Convener*, R. A. M'Naught, Dalry, Galloway ; *Secretary*, James Stewart, Dalry, Galloway. 2 Medals. 1901.

Lanarkshire.

14. AVONDALE.—*Convener*, John Fleming, Meadowbank, Strathaven ; *Secretary*, Robert M'Cowan, Bank of Scotland, Strathaven. 2 Medals. 1901.
15. CARMUNNOCK.—*Convener*, ; *Secretary*, Wm. Fleming, Windlaw, Carmunnock. 2 Medals. 1901.
16. NEW MONKLAND.—*Convener*, John W. Findlay, Bank Street, Airdrie ; *Secretary*, John A. White, Royal Bank, Airdrie. 2 Medals. 1901.
17. SHOTTS CALDERWATERHEAD.—*Convener*, ; *Secretary*, Alex. Waddell, 34 Moir Street, Glasgow. 2 Medals. 1901.

Orkney.

18. SANDAY.—*Convener*, James Irvine, Stove Farm, Sanday, Orkney ; *Secretary*, K. H. Sinclair, Kettletoft, Sanday. 2 Medals. 1901.

Perthshire.

- 19 MIDDLE DISTRICT OF ATHOLL.—*Convener*, James J. Gillespie, St Colmes, Ballinluig ; *Secretary*, J. S. Grant, Ballinluig. 1 Medal. 1901.

Renfrewshire.

20. CATHCART AND EASTWOOD.—*Convener*, ; *Secretary*, J. M. Campbell, Auldfield Place, Pollokshaws. 2 Medals. 1901.

Ross-shire.

21. DINGWALL POULTRY SHOW.—*Convener*, Sir Hector Munro of Foulis, Bart, Dingwall ; *Secretary*, William Sinclair, Athole Court, Dingwall. 2 Medals. 1901. (In abeyance in 1901.)

Rosburghshire.

22. WEST TEVIOTDALE.—*Convener*, John C. Scott of Synton, Hawick ; *Secretary*, James Oliver of Thornwood, Hawick. 2 Medals. 1900.

Stirlingshire.

23. SLAMANNAN.—*Convener*, William Rennie, Parkhead, Slamannan ; *Secretary*, Angus A. M'Lean, Castlehill, Slamannan. 2 Medals. 1901.

Wigtownshire.

24. GALLOWAY AND SOUTHERN COUNTIES.—*Convener*, James Drew, Doonhill, Newton-Stewart; *Secretary*, John Stroyan, 20 Victoria Street, Newton-Stewart. 2 Medals. 1900.

Applications from other Districts must be lodged with the Secretary of the Society by 1st November next.

RULES OF COMPETITION.

1. All Competitions must be at the instance of a local Society.
2. The classes for which Medals are granted must be in accordance with the list at page 44. The Committee shall select the classes, and specify them in the return.
3. A Committee of Management shall be appointed, and the Convener of the Committee must be a Member of the Highland and Agricultural Society.
4. The Money Premiums given in the District must be not less than £2 for each Medal claimed.
5. The Medal for Sheep-Shearing shall not be awarded unless there are three competitors, and it shall always accompany the highest Money Premium. There must not be fewer than two competitors in all the classes.
6. Blank reports will be furnished to all the Secretaries of the different Districts. These must, in all details, be completed and lodged with the Secretary of the Highland and Agricultural Society *on or before the 1st of November next*, with the exception of green crop reports, which must be forwarded on or before the 20th of December, for the approval of the Directors, against whose decisions there shall be no appeal.
7. When a grant has expired, the District shall not be eligible to apply again for aid for two years; and if no competition takes place in a District for two years, the grant shall expire.

PLOUGHING COMPETITIONS.

The Minor Silver Medal will be given to the winner of the first Premium at Ploughing Competitions, provided a Report in the following terms is made to the Secretary, within one month of the Competition, by a Member of the Society:—

FORM OF REPORT.

I, _____ of _____, Member of the Highland and Agricultural Society, hereby certify that I attended the Ploughing Match of the _____ Association at _____ in the county of _____ on the _____ when _____ ploughs competed; _____ of land were assigned to each, and _____ hours were allowed for the execution of the work. The sum of £ _____ was awarded in the following proportions, viz. :—

[*Here enumerate the names and designations of successful Competitors.*]

RULES OF COMPETITION.

1. All Matches must be at the instance of a local Society or Ploughing Association, and no Match at the instance of an individual, or confined to the tenants of one estate, will be recognised.

2. The title of such Society or Association, together with the name and address of its Secretary, must be registered with the Secretary of the Highland and Agricultural Society, 3 George IV. Bridge, Edinburgh.

3. Not more than one Match in the same season can take place within the bounds of the same Society or Association.

4. All reports must be lodged within one month of the date of the Match, and certified by a Member of the Highland and Agricultural Society who was present at it.

5. A Member can only report one Match; and a Ploughman cannot carry more than three Medals in the same season.

6. To warrant the grant of the Medal there must have been twelve ploughs in Competition, and not less than Three Pounds awarded in Prizes by the local Society. The Medal to be given to the winner of the first prize.

7. Ploughmen shall not be allowed any assistance, and their work must not be set up nor touched by others; and attention should be given to the firmness and sufficiency of the work below more than to its neatness above the surface.

8. The Local Committee is required to fix the time to be allowed for ploughing the portion of land, and they are recommended that the time be at the rate of not more than ten hours per imperial acre on light land, and fourteen hours on heavy or stony land.

CLASS III.

COTTAGES AND GARDENS.

The following Premiums are offered for Competition in the Parishes after mentioned.

The Premiums are granted for two years.

PREMIUMS FOR BEST KEPT COTTAGES AND GARDENS.

1. Best kept Cottage	.	.	.	.	.	£1	0	0
Second best	.	.	.	.	.	0	10	0
2. Best kept Cottage Garden	.	.	.	.	.	1	0	0
Second best	.	.	.	.	.	0	10	0

RULES OF COMPETITION.

1. Competitions may take place in the different parishes for Cottages and Gardens, or for either separately.

2. The occupiers of Lodges at Gentlemen's Approach Gates and Gardeners' Houses are excluded, as well as others whom the Committee consider, from their position, not to be entitled to compete. The inspection must be completed by the 1st of October. In making the inspection, the Conveners may take the assistance of any competent judges.

3. It is left to the Committee of the District to regulate the maximum annual rent of the Cottages, which may, with the garden, be from £5 to £7.

4. To warrant the award of full Premiums, there must not be fewer than

three competitors in each class. If there are less than three competitors in each class, only half Premium will be awarded.

5. A person who has gained the highest Premium cannot compete again.

6. If the Cottage is occupied by the proprietor, the roof must be in good repair; if the roof is thatch, it must be in good repair, though in the occupation of a tenant. The interior and external conveniences must be clean and orderly; the windows must be free of broken glass, clean, and affording the means of ventilation. Dunghills, and all other nuisances, must be removed from the front and gables. In awarding the Cottage Premiums, preference will be given to Competitors who, in addition to the above requisites, have displayed the greatest taste in ornamenting the exterior of their houses, and the ground in front and at the gables.

7. In estimating the claims for the Garden Premiums, the judges should have in view—the sufficiency and neatness of the fences and walks; the cleanness of the ground; the quality and choice of the crops; and the general productiveness of the garden.

8. Reports, stating the number of Competitors, the names of successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary *on or before the 1st November next*.

9. When a grant has expired, the District cannot apply again for aid for two years.

Parishes desirous of these Premiums must lodge applications with the Secretary *on or before the 1st November next*.

MEDALS FOR COTTAGES AND GARDENS OR GARDEN PRODUCE AND BEE-KEEPING.

The Society will issue annually two Minor Silver Medals to a limited number of local Associations or individuals, who at their own expense establish Premiums for Cottages and Gardens under £15 of Rent. One of the Medals may be awarded for the best kept Cottage, and the other for either the best kept Garden, Flower-Plot, or Garden Produce, the produce of the cottager's own garden. Two Minor Silver Medals will also be issued to Local Bee-Keeping Associations.

Local Associations or individuals desirous of these Medals, must lodge applications with the Secretary *on or before the 1st November next*.

The Medals are granted for two years.

Aberdeenshire.

1. DAVIOT.—*Convener*, James Durno, Eastertown, Old Meldrum; *Secretary*, J. R. Campbell, Daviot, Old Meldrum. 2 Medals. 1899. (In abeyance in 1900.)

Argyllshire.

2. MULL AND MORVERN.—*Convener*, Mrs Fletcher of Glenaros, Isle of Mull; *Secretary*, Donald Macrae, The Villa, Salen, Aros, Mull. 2 Medals. 1899. (1 Medal for 1901, 1 Medal not offered in 1900.)

Berwickshire.

3. LAUDERDALE BEE-KEEPERS.—*Convener*, George L. Broomfield, Lauder; *Secretary*, Robert Robson, Lauder. 2 Medals. 1900.

Edinburghshire.

4. CURRIE.—*Convener*, Sir James H. Gibson-Craig of Riccarton, Bart., Currie; *Secretary*, Marshall Bryce, Currie. 2 Medals. 1901.

Fifeshire.

5. DYSART.—*Convener*, James Orr, Kirkcaldy; *Secretary*, William R. Gibson, 54 St Clair Street, Kirkcaldy. 2 Medals. 1900.
6. STRATHMIGLO.—*Convener*, R. D. Thom, Pitlochrie, Strathmiglo; *Secretary*, Alex. Sharp, Skene Street, Strathmiglo. 2 Medals. 1901.

Kirkcudbrightshire.

7. KIRKPATRICK-DURHAM.—*Convener*, James Cunningham, Tarbreoch, Dalbeattie; *Secretary*, D. C. G. Johnston, Kirkpatrick-Durham, Dalbeattie. 2 Medals. 1900. (In abeyance in 1900.)

Lanarkshire.

8. CARNWATH.—*Convener*, William Fleming, Calla, Carnwath; *Secretary*, Geo. C. Murray, The Schoolhouse, Carnwath. 2 Medals. 1901.

Nairnshire.

9. AULDEARN AND ARDCLACH.—*Convener*, James Russell, Blackhills, Nairn; *Secretaries*, A. J. Mackintosh, Auldearn, and F. Duff, Kindeary, Auldearn. 2 Medals. 1901.

Perthshire.

10. AUCHTERARDER.—*Convener*,
Secretary, James Bonthron, Auchterarder. 2 Medals. 1900. (In abeyance in 1900.)
11. BLAIRGOWRIE AND RATTRAY.—*Convener*,
Secretary, D. G. Monair, Elmbank, Blairgowrie. 2 Medals. 1901.
12. COUPAR-ANGUS.—*Convener*, David Buttar, Corston, Coupar-Angus; *Secretary*, James Simpson, 46 Causewayend, Coupar-Angus. 2 Medals. 1901.
13. DUNNING.—*Convener*, Robert Gardiner, Henhill, Forteviot; *Secretary*, J. S. Wright, draper, Dunning. 2 Medals. 1900.
14. MENZIES FLOWER SHOW.—*Convener*, Sir Robert Menzies of Menzies, Bart.; *Secretary*, Miss Menzies of Menzies, Camserney Cottage, Aberfeldy. 2 Medals. 1900.
15. MUTHILL.—*Convener*, R. T. N. Speir of Culdees, Muthill; *Secretary*, John White, jun., Wardside, Muthill. 2 Medals. 1901.

Ross-shire.

16. LOCHBROOM.—*Convener*, Murdo Macleay, Broom Cottage, Ullapool; *Secretary*, Hay Mackenzie, bank-agent, Ullapool. 2 Medals. 1900.

Stirlingshire.

17. KILLEARN.—*Convener*, David Wilson of Carbeth; *Secretary*, James Thomson, Post Office, Killearn. 2 Medals. 1899. (In abeyance in 1899.)

18. MILTON. — *Convener*, C. M. King, Antermoney House, Milton of Campsie; *Secretary*, John Whitecross, Milton of Campsie. 2 Medals. 1900. (1 Medal only awarded in 1900, 3 Medals for 1901.)
19. POLMONT. — *Convener*, David Mitchell, Millfield, Polmont; *Secretary*, James Boyd, Garthall, Falkirk. 2 Medals. 1900.

Wigtownshire.

20. PORT-WILLIAM. — *Convener*, C. M. Routledge, Port-William; *Joint-Secretaries*, W. M'D. Selby and W. Dickson, Port-William. 2 Medals. 1901.

REGULATIONS.

1. Competitions may take place in the different districts for Cottages and Gardens, or for either separately. The one Medal may be offered for Cottages, and the other for Gardens, Flower Plots, or Garden Produce, but the two cannot be given in one class.

2. The annual value of each Cottage, with the ground occupied in the parish by a Competitor, must not exceed £15. The occupiers of Lodges at Gentlemen's Approach Gates, and Gardeners in the employment of others, are not entitled to compete.

3. If Competition takes place for Garden Produce in place of the best kept Garden or Flower Plot, such produce must be *bona fide* grown in the Exhibitor's Garden, and he will not be allowed to make up a collection from any other Garden.

4. To warrant the award of a Medal, there must not be fewer than three Competitors.

5. Blank reports will be furnished to the Secretaries of the different Districts. These must, in all details, be completed and lodged with the Secretary of the Highland and Agricultural Society *on or before the 1st November next*, for the approval of the Directors, against whose decisions there shall be no appeal.

6. When a grant has expired, the District cannot apply again for aid for two years, and if no competition takes place in a District for two years the grant expires.

FIRST EDITION.]

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Subject to Orders issued by the Board of Agriculture

HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND

GENERAL SHOW OF STOCK AND IMPLEMENTS

IN

TOWN PARK, TOMNAHURICH,
INVERNESS.

ON 16TH, 17TH, 18TH, AND 19TH JULY 1901.

LAST DAYS OF ENTRY.

IMPLEMENTS AND OTHER ARTICLES—Monday, 13th May.

STOCK, POULTRY, AND DAIRY PRODUCE—Monday, 10th June.

No Entry at ordinary fees taken later than those which are received at the Society's Office, Edinburgh, by first post, or 10 o'clock, on Monday morning (10th June). Post Entries for Cattle, Horses, Sheep, and Swine taken on payment of 10s. additional for each entry (Poultry at double fees) till Wednesday morning (12th June), at the Society's Office, Edinburgh, at 10 o'clock.

COVERED BOOTHS FOR OFFICES—Monday, 10th June

President of the Society.

DONALD CAMERON OF LOCHIEL.

Chairman of the Board of Directors.

A. M. GORDON OF NEWTON.

Condener of the Local Committee.

JOHN MACPHERSON GRANT, YR. OF BALLINDALLOCH.

The District connected with the Show comprises the Counties of Inverness, Elgin, Nairn, Ross and Cromarty, Caithness, Sutherland, and Orkney including Shetland.

REGULATIONS.

GENERAL CONDITIONS.

1. The Competition, except where otherwise stated, is open to Exhibitors from all parts of the United Kingdom.

2. Every Lot must be intimated by a Certificate of Entry, lodged with the Secretary *not later than Monday, 13th May, for Implements and other Entries**

Articles, and Monday, 10th June, for Stock, Poultry, and Dairy Produce. No Entry taken at ordinary fees later than those which are received at the Society's Office by first post, or 10 o'clock, on Monday morning, 10th June. Post Entries for Cattle, Horses, Sheep, and Swine taken on payment of 10s. additional for each entry (Poultry at double fees) till Wednesday morning (12th June), at the Society's Office, Edinburgh, at 10 o'clock. Printed forms of Entry will be issued on application to the Secretary, No. 3 George IV. Bridge, Edinburgh. Admission Orders will be forwarded to Exhibitors, by post, previous to the Show.

Protests. 3. Protests against the awards of the Judges, or against a violation of the judging regulations, must be lodged with the Secretary, at his Office in the Showyard, not later than 9 A.M. on Wednesday, the second day of the Show, and parties must be in attendance at the Secretary's Office, in the Showyard, at 9.30 A.M. that day, when protests will be disposed of. All protests must be accompanied by a deposit of £2, 2s., and if not sustained the sum may be forfeited at the discretion of the Directors.

4. Protests lodged for causes which the protester produces no good evidence to substantiate will render him liable to be reported to the Board of Directors, with the view, if they see reason, of his being prohibited from again entering Stock for a General Show.

Society not liable. 5. The Society shall not be liable for any loss or damage which Stock, Poultry, Dairy Produce, Implements, or other articles may sustain at the Show, or in transit.

Rejecting Entries. 6. The Society reserves the right to reject or cancel any entry or prohibit the exhibition of any entry.

Decisions of Board. 7. The decisions of the Board of Directors are final in all questions respecting Premiums and all other matters connected with the Show, and it shall not be competent for any Exhibitor to appeal against such decisions to, nor seek redress in respect of them from, any other tribunal.

Covered Booths. 8. Covered Booths for Offices (9 feet by 9 feet), purely for business, not for exhibition of goods, can be had for £3, 10s. to Members and £5 to Non-Members. Intimation to be made to the Secretary on or before the 10th of June. Those applying after that date to pay double Entry Money, but no application can be received later than 15th June.

Lights and Smoking. 9. No lights allowed in the Yard at night, and Smoking is strictly prohibited within the Sheds. Those infringing this Rule shall be liable to a fine of 10s.

Water. 10. As the command of water in the Yard is limited, it is particularly requested that waste be avoided.

Subjection to Rules. 11. All persons admitted into the Showyard shall be subject to the Rules and Orders of the Directors.

Powers of Stewards. 12. The Stewards have power to enforce the Regulations of the Society in their different departments, and to bring to the notice of the Directors and Secretary any infringement thereof.

Attendants. 13. All persons in charge of Stock or other Exhibits shall be subject to the orders of the Secretary and Stewards.

Violation of Rules. 14. The violation by an Exhibitor of any one of the Regulations shall render him liable to the forfeiture of all Premiums awarded to him, or of such a portion as the Directors may ordain, and also liable to be disqualified from again, or for a certain number of years, exhibiting at the Shows of the Society; or to have his case otherwise disposed of as the Directors may determine.

Railway Passes. 15. Railway Certificates for Stock and Implements are issued to Exhibitors before the Show along with their Tickets of Admission, one Certificate for the outward and another for the return journey being sufficient for each Exhibitor for any number of exhibits.

Removal of Exhibits. 16. No animal or article can be withdrawn before the formal closing of

the Show at 5 P.M. on Friday ; Steam Engines not till 6 o'clock. Stock and Implements may remain in the Yard till Saturday afternoon.

17. The Premiums awarded, except those withheld till birth of calf or foal is certified, will be paid as soon after the Show as practicable, and, with the exception of the Tweeddale Gold Medal, Special Cups, and Medals, may be taken either in money or in plate. *Payment of Prizes.*

STOCK AND POULTRY.

18. Poultry and Stock will be admitted on Monday, the day before the opening of the Show, and, with the exception of Horses, must be in the Yard before 12 o'clock that night. Horses must be in before 8 o'clock on the morning of Tuesday, except those entered for Jumping only, regarding which special Regulations will be found beside the list of prizes for Jumping. Judging begins at 10 A.M. on Tuesday. Exhibited on Tuesday, Wednesday, Thursday, and Friday. Stock may be admitted on the Saturday preceding the Show, but only by sending two days' prior notice to the Secretary. *Admission of Stock.*

19. An animal which has gained a first Premium at a General Show of the Society cannot again compete in the same class, notwithstanding any alteration in the heights stated for such class, but may be exhibited as Extra Stock. *Former Winners.*

20. All animals, except calves, foals, and lambs shown with their dams, must be entered in the classes applicable to their ages, and cannot be withdrawn after entry, or other animals be substituted in their place. *No substitution of animals.*

21. For prizes given by the Society, no animal shall be allowed to compete in more than one class ; but this Rule does not apply to the Jumping and Driving Competitions. *One class only.*

22. Shorthorn, Aberdeen-Angus, Galloway, and West Highland animals must be entered in the herd-books, or the Exhibitor must produce evidence that his animal is eligible to be entered therein. *Herd-books.*

23. Stock must be *bona fide* the property of the Exhibitor on the last day of Entry. *Ownership.*

24. The Schedule of Entry must be filled up so far as within the knowledge of the Exhibitor. The Society shall have power at any time to call upon an Exhibitor to furnish proof of the correctness of any statement in his entry.

25. The name of the Breeder, if known, must be given, and if the Breeder is not known, a declaration to that effect, signed by the Exhibitor, must be made on the Entry Schedule, and no pedigree will be entered in the Catalogue when the Breeder is unknown. *Particulars of entries.*

26. Should it be proved to the satisfaction of the Directors that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Directors or Judges as to its qualification or properties, or that information required in the Schedule and known or easily ascertained by the Exhibitor has been withheld, such animal may be disqualified either before or after a prize has been awarded to it, and the case may be reported to the Directors, in order that the Exhibitor may be disqualified from again competing at the Society's Shows, or his case otherwise disposed of as the Directors may determine. *Entries disqualified.*

27. When an animal has previously been disqualified by the decision of any Agricultural Association in the United Kingdom, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it, and the grounds thereof, in his entry, to enable the Directors to judge of its validity. Any person who is disqualified from exhibiting at any Show in the United Kingdom shall be prohibited from exhibiting at

any General Show of the Society, unless with the special consent of the Board.

Height of Horses. 28. All Horses or Ponies entered in classes in which a particular height is stated shall before being judged be measured with their shoes on. No subsequent measuring or alteration of shoes will be permitted.

Overfeeding. 29. Breeding Stock must not be shown in an improper state of fatness, and the Judges are requested not to award Premiums to overfed animals; and no Cattle or Sheep which have been exhibited as Fat Stock at any Show are eligible to compete in the Breeding Classes for the Society's Prizes.

Parades. 30. Horses and Cattle must be paraded at the times stated in the Programme of the Show, and when required by the Stewards, and under their direction. In Parade, Horses must be ridden or led as provided in their respective classes. Prize and commended animals will receive two rosettes each, which must be attached to the head of the animal, one on each side. Attendants must be beside their animals *twenty minutes before the hour of Parade*, and be ready to proceed to the ring immediately on receiving the order of the Stewards. Infringement of this Rule, or failure of any attendant to obey the orders of the Society's officials, will render the Exhibitor liable to a fine of 20s. for each separate infringement or act of disobedience, and to the forfeiture of any or all of the Prizes awarded to him at this Show.

Responsibility of Exhibitors. 31. Exhibitors shall be answerable for all acts, whether committed by themselves, their servants, or others in charge of their Stock, and shall be responsible for the condition of their animals during the whole time they remain in the Showyard.

Moving from stalls. 32. No animal shall be taken out of its stall after 10 A.M. during the Show except by order of the Stewards, or with permission of the Secretary.

Washing Cattle. 33. Cattle shall not be taken out of their stalls to be washed after the Judging has been finished. Those infringing this Rule shall be liable to a fine of 10s.

Sires. 34. Aged Bulls and Stallions must have had produce, and, along with two-year-old Bulls, three-year-old Colts, and two-shear and aged Tups, have served within the year of the Show.

Cows. 35. All Cows must have had calves previous to the Show. When exhibited, Highland Cows must be in milk or have calf at foot, and have had a calf within 9 months of the Show. Cows of other breeds, when exhibited, must either be in milk or in calf: if in milk, birth must have been within 9 months of the Show; if in calf, birth must be certified within 9 months after the Show.

In-calf Heifers. 36. Two-year-old Heifers of the Shorthorn, Aberdeen-Angus, and Galloway breeds, two-year-old Yeld Ayrshire Heifers, and three-year-old Highland Heifers, must be in calf when exhibited, and the Premiums will be withheld till birth be certified, which must be within 9 months after the Show.

37. Animals of any age that have had a calf must be shown as Cows.

Mares. 38. A Mare entered in a class for "Mares with foal at foot" must have produced a foal after 1st January of the year of the Show, must have regularly nursed her own or another foal, and must have the foal with her in the Show. If the mare's own foal is alive it must be the foal shown with the mare. In the case of a Mare that has not foaled before the Show, or whose foal has died, she shall, if not in milk, be eligible without further entry to compete among the Yeld Mares. Agricultural Yeld Mares must produce a foal within 12 months from the first day of the Show. A Mare in a class for "Mares or Geldings" may or may not have had a foal in the year of the Show, but shall not have her foal exhibited with her, nor be in milk at the time of the show.

39. With reference to Regulations 34, 35, and 36, birth of at least a seven months' calf must be certified; and in regard to Regulation 38, birth of at least a nine months' foal; or in the case of death, a Veterinary Surgeon's certificate must be produced certifying that at the time of death the animal was so far advanced with calf or foal that if it had lived it would have produced a calf or foal, as required by Rules 34, 35, 36, 38, and 39.

40. Except when otherwise provided the awards of Special Prizes shall not be subject to the Regulations as to calving and foaling.

41. Any artificial contrivance or device of any description found on or proved to have been used on an animal, either for preventing the flow of milk or for any other improper purpose, will disqualify that animal from being awarded a Premium, and the Owner of said animal shall be prohibited from again entering Stock for any of the Society's General Shows, for such a period as the Directors may see fit.

42. During the time the Show is open to the public no rug shall be hung up so as to conceal any animal in a horse-box or stall, except with the special permission of the Steward of that department.

43. In the classes for Hunters four years old and upwards the Judges are empowered to transfer to the proper classes horses which, in regard to weight-carrying, are in their opinion entered in the wrong classes.

44. Judges are particularly requested to satisfy themselves, as far as possible, regarding the soundness of all Horses before awarding the Prizes, and to avoid giving Prizes to animals showing symptoms of hereditary diseases. The Judges may consult the Society's Veterinary Surgeon if they deem it expedient. No protests on veterinary grounds will be received.

45. All Ewes must have reared lambs in the year of the Show; and Ewes of the Blackfaced and Cheviot breeds must be in milk, and have their lambs at foot.

46. Sheep must have been clipped bare after 1st February of the year of the Show, and the Judges are instructed to examine the fleeces of the Sheep selected for Prizes, and to cast those on which they find any of the former fleece. This Rule does not apply to Cheviot sheep.

47. Sows must have reared pigs in the year of the Show or be in pig; and Pigs must belong to the same litter, and be uncut.

48. In Poultry the Aged Birds must have been hatched previous to, and Cockerels and Pullets in, the year of the Show.

49. Bulls must be secured by nose-rings, with chains or ropes attached, or with strong halters and double ropes. All Cattle, other than Highland Cattle, must be tied in their stalls.

50. Servants in charge of Stock must bring their own buckets or pails, and a piece of rope or sheep-net to carry their forage. Mangers, sheep and pig troughs, will be provided.

51. Loose-boxes will be provided for Stallions, three, two, and one year-old entire Colts; for two- and one-year-old Fillies, and for Mares with foals at foot; closed-in stables for all the other Horses, and covered accommodation for the whole of the other Live Stock. In no case will a box be provided except for the classes here specified. Stalls (floored) for attendants on Cattle, Horses, and Sheep will be provided at same rates as those charged for Stock.

52. Five days' supply of straw, hay, grass, and tares will be provided free by the Society. Any additional fodder or other kinds of food required will be supplied at fixed prices in the Forage-yard. Any servant removing bedding from an adjoining stall will be fined in double the amount taken. Exhibitors may fetch their own cake or corn to the Yard, but not grass, tares, hay, or straw. Sawdust must not be used as

Calves and Foals.

Special Prizes.

Tampering with animals.

Concealing animals.

Hunters.

Soundness of Horses.

Ewes.

Clipping.

Sows.

Poultry.

Securing Cattle.

Feeding appliances.

Accommodation for animals.

Fodder.

bedding for Stock. Coops, food, and attendance for Poultry will be provided by the Society.

Removal. 53. Cattle, Sheep, Swine, or Poultry cannot be removed from the Yard till 5 p.m. on Friday, the last day of the Show, except on certificate by the Veterinary Surgeon employed by the Directors, countersigned by the Steward of the department and the Secretary.

Withdrawal of horses over night. 54. Horses may be withdrawn at the close of the Show on Tuesday, Wednesday, and Thursday, on a deposit of £5 for each animal, which shall be forfeited, along with any prize money it may have gained, if the animal is not brought back. They must return between 7 and 7.30 the following morning, and those not in before 8 shall forfeit 10s. Horse passes to be applied for at the Secretary's Office between 5 and 6 p.m. on Tuesday, and the deposit, unless forfeited in whole or in part, will be returned between 12.30 and 2.30 on Friday.

Order in removal. 55. When the Stock is leaving the Yard, no animal is to be moved till ordered by those in charge of clearing the Yard. Those transgressing this Rule shall be liable to a fine of 10s., and detained till all the other Stock is removed.

JUDGING STOCK AND POULTRY.

Opening Gates. 56. On Tuesday, the first day of the Show, no person will be admitted, except Servants in charge of Stock, till 8 a.m., when the Gates are opened to the public.

Judging. 57. The Judges will commence their inspection at 10 a.m. The spaces reserved for the Judging will be enclosed, and no encroachment shall be permitted.

Insufficient merit. 58. In no case shall a Premium be awarded unless the Judges deem the animals to have sufficient merit; and where only one or two lots are presented in a section, and the Judges consider them unworthy of the Premiums offered, it shall be in their power to award a lower prize, or to suggest the removal of any lot which appears to them unworthy of a place in the Yard.

Commendations. 59. In addition to the Premiums, the Judges are authorised to award three Commendations in each section, if the entries are numerous and the animals of sufficient merit. These Commendations consist of—Very Highly Commended, Highly Commended, and Commended.

Ayrshire Cows and Heifers. 60. Ayrshire Cows which have not calved before the Show, whether entered in the class for Cows in Milk or for Cows in Calf, shall be judged along with the Cows in Calf, and Ayrshire Cows or Heifers which have calved before the Show—in whichever of the two classes entered—shall be judged along with Cows in Milk.

Attending Members. 61. One Member of Committee and one or two Directors shall attend each section of the Judges. It will be their duty to bring the animals out to the Judges and to see that no obstruction is offered to them, and that the space reserved for them is not encroached upon; to ticket the prize animals; to send the Nos. of prize animals to the Award Lectern near the Secretary's office; to assist the Judges in completing their return of awards; and should any difficulty arise, to communicate with the Stewards or Secretary.

62. It shall not be competent for any Exhibitor, nor for his Factor or Land-Steward, to act as a Judge or attending Member in any class in which he is competing.

DAIRY PRODUCE.

63. Dairy Produce will be received in the Showyard on Monday, the day before the opening of the Show, and till 8 A.M. on Tuesday, the first day of the Show. Judged at 10 A.M. on Tuesday. Exhibited Tuesday, Wednesday, Thursday, and Friday.

64. Dairy Produce must have been made on the Exhibitor's farm this year. No Exhibitor shall show more than one lot in each class. No lot can be removed from the Yard till 5 P.M. on Friday, the last day of the Show. The Society undertakes no responsibility for the receipt or despatch of exhibits, nor for the loss of exhibits, nor for any injury they may sustain during the Show

STALL RENT (INCLUDING ENTRY FEE).

65. The following rates (which include Entry Fees and Stall Rent) shall be paid by Exhibitors when making their Entries :—

	Members	Non-Members
	s. d.	s. d.
Stalls for Cattle, each	15 0	25 0
Boxes for Horses in Classes 37, 38, 39, 44, 52, 53, 54, 58, and 59	30 0	40 0
Boxes for Horses in Classes 40, 47, 48, 49, 50, 56, 57, 60, 61, 62, 65, 67, 69, 70, and 71	22 6	32 6
Stalls for Horses in Classes 41, 42, 43, 45, 46, 51, 55, 74, and 75	20 0	30 0
Stalls for Horses in Classes 63, 64, 66, 68, 72, and 73	15 0	20 0
Shed Accommodation for Machines for driving competitions, each	5 0	10 0
Sheep or Swine, per pen	10 0	15 0
Wool, per entry	2 6	5 0
Poultry, each entry	2 0	3 0
Dairy Produce, each entry	4 0	6 0
Covered Booths for offices, 9 feet by 9 feet	70 0	100 0
Newspaper offices	£2, 10s.	

Entries in more than one Class.—In the case of animals entered in more than one class, the entry fee shall be five shillings for each class after the first. This does not apply to the Jumping Competitions.

EXTRA STALL FOR ATTENDANTS.

66. Exhibitors of Stock shall be entitled to take an extra Stall or Box for the accommodation of their attendants, but they must state when making their Entry that the Stall or Box is to be used for that purpose, and remit rent, which is at the same rate as stated above for the particular class of stock. They must also state next to which animal they wish the attendant's accommodation to be placed.

IMPLEMENTS AND OTHER ARTICLES.

67. Implements will be received in the Yard from Tuesday, 9th July, till 5 o'clock on the afternoon of Monday, 15th July. Exhibited Tuesday, Wednesday, Thursday, and Friday. *Admission.* The Schedule of Entry must be filled up so far as within the knowledge of the Exhibitor, and prices must be stated.

- Premiums.* 68. No Money Prizes or Medals, except when specially offered, will be given by the Society for Implements of any kind.
- Refusing Entries.* 69. Agricultural Implements, and Implements and collections of articles not Agricultural, will be received for Exhibition, but the Secretary is entitled to refuse Entries from dealers in articles not deemed worthy of Exhibition.
- Local Operatives.* 70. In order to encourage exhibits of Agricultural Implements from operative Blacksmiths and Carpenters in the district of the Show, open space will be provided for these in some less prominent part of the Yard at a charge of 10s. for space 10 feet wide and 20 feet deep.
- Order of Implements.* 71. Implements will be entered in the following sections—viz., 1st, Under Cover, for Agricultural Implements; 2nd, Open, for Agricultural Implements; 3rd, Exhibits not Implements of Husbandry, either under cover or open, as may be deemed necessary by the Secretary; 4th, Motion Yard; 5th, Open space for Agricultural Implements from operative Blacksmiths and Carpenters in the district of the Show. Exhibitors must specify the space they require.
- Articles not entered.* 72. Every article to be exhibited must be entered on the Society's Entry Form. Any article not so entered that is taken to the Show is liable to be ordered out of, or removed from, the Showyard, or confiscated to the Society. Exhibitors infringing this rule are moreover liable to a fine of £1.
- Selling by auction and noisy behaviour forbidden.* 73. "Cheap-Jacks" are not admitted to the Showyard. The selling of goods by auction, shouting, and other behaviour calculated to annoy visitors or Exhibitors, are strictly forbidden. Exhibitors infringing this Regulation are liable to a fine of £1, and to have themselves and their goods ordered out of, or removed from, the Showyard, or to have their goods confiscated to the Society.
- Placing Exhibits.* 74. The articles of each Exhibitor must be all placed in one stand, except Implements in motion, and must not on any account extend beyond the allotted space. No article shall be moved out of its stand, or the stand dismantled, till the termination of the Show, at 5 P.M. on Friday. Those infringing this Rule shall be liable to a fine of 10s.
- Removing Exhibits.* 75. When the ground requires to be broken, the turf must be carefully lifted and laid aside, and the surface must be restored to the satisfaction of the Society, and at the expense of the Exhibitor. Failing this being done, the Society shall be at liberty to restore the ground and charge the cost to the exhibitor.
- Restoring Turf.* 76. Exhibitors must arrange their own articles *within* the space allotted to them before 9 o'clock on Tuesday, and to the satisfaction of the Stewards in charge of the Implement Yard.
- Arranging Exhibits.* 77. Exhibitors are not allowed to distribute handbills anywhere in the Yard except at their own Stand; and they must not for this or any other purpose encroach upon the adjacent alleys or open spaces.
- Handbills.* 78. Exhibitors are required to have their Stands and the portions of the alleys immediately adjoining them swept up before eight o'clock on each morning of the Show.
- Sweeping Stands, &c.* 79. All Machines requiring steam or fire must be entered as such in the Certificate, and will be placed in the Motion Yard. *Coke only shall be used in all cases where fire is required.* Coal shall not be used at any time in the Showyard. Those infringing this Rule shall incur a penalty of £5.
- Fuel.* 80. No Steam Engine shall be driven in the Yard at a greater speed than 4 miles an hour. Traction Engines shall not be used in conveying Exhibits or other goods into, from one place to another in, or out of the Showyard.
- Steam Engines.* 81. Locomotive and Traction Engines and other Machines must not be moved from their places without permission of the Secretary or Stewards, and must not leave their stands till 6 P.M. on Friday.

82. There must be attached to each Implement, when forwarded to the Show, a label bearing the Exhibitor's name, and that of the Implement, as well as the number of the Exhibitor's stand. *Consigning Imple-ments.*

83. The carriage of all Implements must be prepaid.

84. Each Exhibitor in the Implement Department will receive one free Ticket of Admission to the Showyard for himself or a member of his firm, and will receive, in addition, for the use of attendants employed by him at his Stand, two Tickets of Admission for each complete ten feet of shedding in the Motion Yard, and one Ticket for each complete ten feet of shedding in the other sections. No additional Free Tickets can be issued in any circumstances whatever. Additional Attendants' Tickets, not more than five for any one Exhibitor, may be purchased at 5s. each. *Exhibitors' and Attendants' Tickets.*

85. The Tickets of Admission for Exhibitors and Attendants referred to in the foregoing Regulation will (about fourteen days prior to the Show) be issued to the Exhibitors in blank, with the number of the Exhibitor's Stand. The name of the person for whom each ticket is intended must be written on it before it is used. Each person holding a Free Ticket of Admission must sign his or her name on the back thereof, and must also, when required, sign his or her name in the book at the Entrance Gate. Exhibitors' attendants are strictly cautioned not to lend or transfer their Tickets, which can be used only by the persons whose names they bear, and who must be *bona fide* acting for, or employed by, the Exhibitor. No Ticket is transferable. An Exhibitor is liable to a fine of £1 for each case of transfer or other improper use of a Ticket issued to himself or employee. *Tickets to be filled up and signed.*
Tickets not Transferable.
Improper use of Tickets.

STALL RENT.

86. Ground to be taken in spaces of 10 feet frontage by 20 feet deep, except in Motion Yard, which is to be 10 feet or any larger amount of frontage by 50 feet deep.

87. Rates for space, payable by Exhibitors when making their Entries:—

	Members	Non-Members.
Space without Shedding, 20 feet deep, per 10 feet .	£1 5 0	£1 15 0
Shedding, 20 feet deep, 7 feet high, per 10 feet .	1 5 0	1 15 0
Shedding, 20 feet deep, 7 feet high, <i>boarded at back</i> , per 10 feet .	1 12 0	2 2 0
Space in Motion Yard, without Shedding, 50 feet deep, per foot .	0 5 0	0 8 0
And with Shedding, 20 feet deep, 10 feet high, per foot	0 7 0	0 10 0
Covered Booths for offices, 9 feet by 9 feet, each .	3 10 0	5 0 0
Newspaper offices, each	£2, 10s.	

ADMISSION OF THE PUBLIC.

The public will be admitted daily at 8 A.M. Judging begins on Tuesday at 10 A.M. The charges for admission to the Yard will be—Tuesday, from 8 A.M. till 5 P.M., 5s. Wednesday, from 8 A.M. till 5 P.M., 3s. Thursday, from 8 A.M. till 5 P.M., 2s. Friday, from 8 A.M. till 5 P.M., 1s.

ADMISSION OF MEMBERS AND EXHIBITORS.

On exhibiting their "*Member's Ticket*," which is strictly not transferable, Members of the Society are admitted free to the Showyard and to the Enclosures and Stands around the Large Ring, excepting the Reserved Seats in the Grand Stand, and such other parts as may be reserved for any special purpose. Tickets will be sent to all Members residing in the United Kingdom whose addresses are known, and on no

account will duplicates be issued. All Members not producing their tickets must pay at the gates, and the admission money will not on any account be returned.

Tickets of admission to the Showyard are sent to Exhibitors of Stock, Poultry, Dairy Produce, and Wool (not Members) whose Entry Fees amount to not less than 10s.

For Exhibitors of Implements and their assistants tickets are issued as provided in the Regulations for Implements.

Tickets for attendants on Stock are not available to admit to the Yard between 11 A.M. and 5 P.M.; and any of these attendants requiring to leave the Yard during the day cannot be again admitted except by a special pass (to be applied for at the Ticket Gate), which must be given up on his return.

RESERVED SEATS IN GRAND STAND.

Reserved Seats in the Grand Stand (numbered).

For Charges, apply to Secretary.

VARIOUS.

Placards, except those of the Society, are prohibited both inside the Showyard and on the outside of the Boundary Fence, with the exception of those belonging to Exhibitors, whose right is confined to their own stalls. No newspapers or any other article allowed to be carried about the Yard for sale or display. No strolling bands or musicians admitted.

No Carriages or Equestrians admitted without special leave from the Directors, and then only for Invalids. Bath-chairs may be brought in.

Premium Lists, Regulations, and Certificates of Entry may be obtained by applying at the Secretary's Office, No. 3 George IV. Bridge, Edinburgh.

All Communications should be addressed to JAMES MACDONALD, Esq., Secretary of the Highland and Agricultural Society of Scotland, No. 3 George IV. Bridge, Edinburgh.

Address for Telegrams—"SOCIETY," EDINBURGH.

LAST DAYS OF ENTRY.

IMPLEMENTS AND OTHER ARTICLES—Monday, 13th May.

STOCK, POULTRY, AND DAIRY PRODUCE—Monday, 10th June.

No Entry at ordinary fees taken later than those which are received at the Society's Office, Edinburgh, by first post, or 10 o'clock, on Monday morning (10th June). Post Entries for Cattle, Horses, Sheep, and Swine taken on payment of 10s. additional for each entry (Poultry at double fees) till Wednesday morning (12th June), at the Society's Office, Edinburgh, at 10 o'clock.

COVERED BOOTHS FOR OFFICES—Monday, 10th June

RAILWAY ARRANGEMENTS

The Railway Companies will be furnished with a list of the Exhibitors of Stock and Implements, after the 29th June, and all applications for horse-boxes and trucks, and for information as to arrangements of Special Trains, must be made by the Exhibitors themselves with the Stationmaster where their stock is to be trucked.

The arrangements made by the Railway Companies for the conveyance of Live

Stock and Goods to and from the Show are indicated below, but exhibitors are recommended to apply to the respective companies for full particulars:—

1. Live Stock and Goods to the Show to be charged ordinary rates.
2. Live Stock and Goods from the Show, *if sold*, to be charged ordinary rates.
3. Live Stock and Goods from the Show, *if unsold*, to be carried at half rates back to the station whence they were sent, at owners' risk, on production of a certificate from the Exhibitor to the effect that they are really unsold; failing production of such certificate, ordinary rates must be charged. The reduction to half rate is to be allowed only when the animals or goods are returned by the same route as that by which they were conveyed to the Show. The minimum charge for Stock returned at half rates will be one-half the ordinary minimum.

If the unsold Live Stock which was carried on the outward journey by Passenger Train in horse-boxes be required to be returned by Goods Train in cattle trucks, half the Goods Train rates must be charged.

If the unsold Live Stock which was carried on the outward journey by Goods Train in cattle trucks be required to be returned by Passenger Train in horse-boxes, half the Passenger Train rates must be charged.

4. Horses and Cattle, when sent for exhibition from one Agricultural Show to another, in another part of the country, are charged the ordinary single rates in respect of each journey, from point to point, up to the last station to which they are sent for exhibition. If remaining unsold when returned from the latest Show to the originating or home station, they are—on production of the necessary certificates—charged half rates, provided such return journey is made by the line of the company by whose route it was conveyed on the outward journey, or, where more than one company is concerned, by the same route as conveyed on the outward journey. If conveyed by Goods Train, Unsold Live Stock transferred from one Agricultural Show to another in another part of the country must be charged ordinary rates.

5. Unsold goods, previously carried by railway, transferred from one Agricultural Show to another, in another part of the country, will be conveyed at half rates at owners' risk, on production of certificate from the Exhibitor to the effect that they are unsold; failing production of such certificate, ordinary rates will be charged.

6. Poultry to be charged ordinary rates both ways, and will not be accepted for conveyance unless the carriage charges are prepaid.

7. Horse-boxes, or other Passenger Train vehicle, will not be provided for the carriage of Live Stock sent by Goods Train and invoiced at Goods Train rates. *For rates for Horse-boxes by Passenger and Special Trains, apply to the Railway Companies.*

8. Provender conveyed to Agricultural Shows with Live Stock will be charged ordinary rates, except so much of the same as may be required on the journey.

9. Men, certified by the owners to be *bona fide* in charge of Live Stock, to be conveyed free in the same train as the animals, as follows: One man for each consignment, except where the consignment requires more than one vehicle, when one man for each vehicle may be sent free; but no pass is given unless the charge for the consignment amounts to as much as the charge for one horse. When two or three horses forming one consignment are sent in the same horse-box, and a man is required to travel with each animal, the men may be conveyed free, provided each horse is charged at the single horse rate. Upon both the outward and homeward journeys a separate certificate and contract must be given, which must be retained by the stationmaster at the outward or homeward starting point, as the case may be.

10. The ordinary rates charged for carriage do not in any case include delivery to, or collection from, the Show ground.

11. Agricultural Societies' Show Plant must be charged at Class C rates, station to station.

12. Tents, Canvas, and other articles carried to Shows, not for exhibition, to be charged the ordinary rates both going and returning.

13. The carriage of all Live Stock, Implements, and other articles going to the Show for exhibition must be *prepaid*.

DELIVERY CHARGES.

The following will be the Charges for the Delivery or Collection of Live Stock, Implements, and other articles between the Railway Stations at Inverness and the Show ground :—

1. General traffic, 2s. 6d. per ton (minimum charge, 1s. 6d.)
2. Implements and Machinery (Agricultural), not exceeding 1 ton each, 2s. 6d. per ton (minimum charge, 2s.)
3. Implements and Machinery (Agricultural), on their own wheels (specially hauled), not exceeding 1 ton, 3s. each.
4. Single articles, exceeding 1 ton, but not exceeding 3 tons, 3s. per ton.
5. Single articles, exceeding 3 tons, but not exceeding 5 tons, 6s. per ton.
6. Single articles, exceeding 5 tons, by special arrangement only, but no less charge than 8s. per ton.
7. Rustic Houses, by special arrangement only, but no less charge than 7s. 6d.
8. Carriages, four-wheeled, 3s. each.
9. Carriages, two-wheeled, 2s. each.
10. Cattle, in floats, 3s. 6d. per head (minimum charge, 5s.)
11. Sheep and Pigs, in floats, 1s. per head (minimum charge, 5s., and maximum charge, 7s. 6d. for each float).

THE PRESIDENT'S CHAMPION MEDALS

A Champion Medal is given by DONALD CAMERON OF LOCHIEL, President of the Society, for the *best Animal or pen* in each of the following sections :—

- | | | |
|--------------------------|----------------------------------|-----------------------|
| 1. Shorthorn. | 9. Clydesdale Mares and Fillies. | 16. Cheviot. |
| 2. Aberdeen-Angus. | 10. Hunters. | 17. Border Leicester. |
| 3. Galloway. | 11. Hackneys. | 18. Shropshire. |
| 4. Highland. | 12. Harness Horses. | 19. Half-bred. |
| 5. Ayrshire. | 13. Ponies. | 20. Oxford Down. |
| 6. Fat Cattle. | 14. Shetland Ponies. | 21. Suffolk. |
| 7. Clydesdale Stallions. | 15. Blackfaced Sheep. | 22. Swine. |
| 8. Draught Geldings. | | |

NOTE.—Animals entered as Extra Stock may compete for these Medals. Former Winners of the President's Medals are eligible. The Society shall have the right to photograph the Winners for publication in the 'Transactions.' At this Show no animal can be awarded more than one of these Medals.

CATTLE

Class	SHORTHORN.	Premiums.			
		1st. £	2nd. £	3rd. £	4th £
	Tweeddale Gold Medal for best Shorthorn Bull—£20.				
1.	Bull calved before 1899 . . .	15	10	5	3
2.	Bull calved in 1899 . . .	15	10	5	3
3.	Bull calved in 1900 . . .	12	8	4	2
	Breeder of best Bull of any age in the three Classes—The Silver Medal.				
4.	Cow of any age . . .	12	8	4	2
5.	Heifer calved in 1899 . . .	10	5	3	2
6.	Heifer calved in 1900 . . .	10	5	3	2
	¹ Best Female in the three Classes—£20.				
	² Champion Prize of £20 for the best Shorthorn in the foregoing Classes.				
	<i>President's Medal for best Shorthorn.</i>				
					£158

ABERDEEN-ANGUS.

³ Two Silver Cups, each of the value of £50, for the best Bull of any age and for the best Cow of any age (Heifers excluded) in the Aberdeen Angus cattle classes. These are to be Challenge Cups, and are to be known as the "Ballindalloch Challenge Cups." They are offered under the following conditions: 1. The Directors shall assume charge of the Cups, and shall frame such rules for their safety as they may decide upon. 2. Each Cup shall be held by the winner for one year as a Challenge Cup, and shall become the property of the exhibitor who shall win it five times, not necessarily in succession. 3. The Society shall, at their own expense, cause to be engraved on each Cup each year, the year, the place of the Show, name of successful exhibitor, name and herd-book number of the animal, and name of its breeder. 4. The Society shall award to the breeder of the successful animals a Silver Medal, bearing that he is the breeder of the winner of the "Ballindalloch Challenge Cup." 5. In every other respect the Cups shall be won according to regulations which the Directors may from time to time enact.

7.	Bull calved before 1st Dec. 1898 . . .	15	10	5	3
8.	Bull calved on or after 1st Dec. 1898 . . .	15	10	5	3
					66
Carry forward					£224

¹ Given by the Shorthorn Society.

² Given by Shorthorn Breeders in the counties of Inverness and Ross.

³ The Cup for Bulls given by Sir George Macpherson Grant, Bart., and that for Cows by the late Mr C. Macpherson Grant of Drumduan.

		Brought forward £224			
		Premiums.			
ABERDEEN-ANGUS— <i>continued.</i>		1st.	2nd.	3rd.	4th.
Class		£	£	£	£
9.	Bull calved on or after 1st Dec. 1899 . ¹ Champion Cup, value £50, for the best Bull in the three Classes. Breeder of best Bull of any age in the three Classes—The Silver Medal.	12	8	4	2
10.	Cow of any age ² Champion Cup, value £50, for the best Cow of any age in the above Class.	12	8	4	2
11.	Heifer calved on or after 1st Dec. 1898	10	5	3	2
12.	Heifer calved on or after 1st Dec. 1899 ³ Champion Gold Medal for best breeding animal of the breed in the Showyard.	10	5	3	2
					92
<i>President's Medal for best Aberdeen-Angus Animal.</i>					
GALLOWAY.					
13.	Bull calved before 1st Dec. 1898 .	15	10	5	3
14.	Bull calved on or after 1st Dec. 1898 .	15	10	5	3
15.	Bull calved on or after 1st Dec. 1899 . Breeder of best Bull of any age in the three Classes—The Silver Medal.	12	8	4	2
16.	Cow of any age	12	8	4	2
17.	Heifer calved on or after 1st Dec. 1898	10	5	3	2
18.	Heifer calved on or after 1st Dec. 1899 <i>President's Medal for best Galloway.</i>	10	5	3	2
					158
HIGHLAND.					
19.	Bull calved before 1899	15	10	5	3
20.	Bull calved in 1899	15	10	5	3
21.	Bull calved in 1900 Breeder of best Bull of any age in the three Classes—The Silver Medal.	12	8	4	2
22.	Cow of any age, in Milk, or with Calf at foot	12	8	4	2
23.	Heifer calved in 1898	10	5	3	2
24.	Heifer calved in 1899 ⁴ Champion Cup, value £10, for best animal in the Highland Classes. <i>President's Medal for best Highland Animal.</i>	10	5	3	2
					158
					Carry forward £632

¹ Given by Sir George Macpherson Grant, Bart.² Given by the late Mr C. Macpherson Grant of Drumduan.³ Given by the Polled Cattle Society.⁴ Given by Mr L. A. Macpherson of Corrimony.

Brought forward				£632
Premiums.				
AYRSHIRE.				
Class	1st.	2nd.	3rd.	
	£	£	£	
25. Bull calved before 1899	12	8	4	
26. Bull calved in 1899	12	8	4	
27. Bull calved in 1900	8	5	3	
Breeder of best Bull of any age in the three Classes—The Silver Medal.				
28. Cow calved before 1898 in Milk	10	7	3	
29. Cow in Milk, calved after 1st Jan. 1898	10	7	3	
30. Cow of any age in Calf, or Heifer calved in 1898 in Calf and due to calve within nine months after the Show	10	7	3	
31. Heifer calved in 1899	10	5	3	
32. Heifer calved in 1900	8	5	3	
<i>President's Medal for best Ayrshire.</i>				158
FAT CATTLE				
33. Ox, any pure-bred or cross, calved after 1st Dec. 1898	5	2	—	
34. Ox, any pure bred or cross, calved after 1st Dec. 1899	5	2	—	
35. Heifer, any pure-bred or cross, calved after 1st Dec 1898	5	2	—	
36. Heifer, any pure-bred or cross, calved after 1st Dec. 1899	5	2	—	
<i>President's Medal for best fat animal.</i>				28
				£818

HORSES

FOR AGRICULTURAL PURPOSES.

Premiums.				
DRAUGHT STALLIONS.				
	1st.	2nd.	3rd.	4th.
	£	£	£	£
37. Stallion foaled before 1898	20	15	10	4
38. Entire Colt foaled in 1898	20	15	10	4
39. Entire Colt foaled in 1899	20	12	8	4
40. Entire Colt foaled in 1900	15	10	6	4
				£177
Breeder of best Male Animal of any age in the four Classes—The Silver Medal.				—
<i>President's Medal for best Clydesdale Stallion.</i>				Carry forward £177

No animal is allowed to compete in more than one Class, except that horses entered in other Classes may also compete in the Jumping and Driving Classes.

Brought forward		...	...	£177	
DRAUGHT GELDINGS.		1st.	2nd.	3rd.	4th.
Class		£	£	£	£
41.	Draught Gelding foaled before 1898	10	5	3	—
42.	Draught Gelding foaled in 1898	6	4	3	—
43.	Draught Gelding foaled in 1899	6	4	3	—
		<hr/>			
<i>President's Medal for best Draught Gelding.</i>					

DRAUGHT MARES AND FILLIES.

44. Mare of any age, with Foal at foot	20	12	7	4
45. Yeld Mare foaled before 1898	12	9	6	4
46. Yeld Mare or Filly foaled in 1898	12	9	6	4
47. Filly foaled in 1899	12	9	6	4
48. Filly foaled in 1900	12	9	6	4

167

**Best Clydesdale Mare or Filly—Cawdor Challenge Cup,
value 50 guineas. See Conditions below.**

CONDITIONS OF COMPETITION FOR THE THIRD CAWDOR
CHALLENGE CUP FOR MARES. (VALUE 50 GUINEAS.)

1. This Cup is offered by the Clydesdale Horse Society of Great Britain and Ireland for the best Clydesdale Mare or Filly registered in the Clydesdale Stud-book, entered in any of the Draught Horse classes, at the Show at which it may be competed for.

2. The Council of the Clydesdale Horse Society shall, at a meeting held not later than the month of August in any year, decide at what Show or Shows the "Cawdor Challenge Cups" shall be competed for in the year immediately following.

3. This Cup must be won three times by an Exhibitor with different animals (but not necessarily in consecutive years) before it becomes his absolute property; and immediately after an award has been made, and official notification thereof has been received by the Secretary of the Clydesdale Horse Society from the Secretary of the Society under whose auspices the Competition has taken place, the name of the winner, and of the animal with which the Cup has been won, will be engraven on the Cup.

4. The winner of the Cawdor Challenge Cup, other than the absolute winner, shall, before delivery thereof is made to him, give security to the Clydesdale Horse Society that he shall surrender the same to the Society and deliver it at the Society's office when called upon to do so.

5. Until the Cup be won outright, the winner of the Cawdor Challenge Cup will receive the Clydesdale Horse Society's Silver Medal as a memento of his winning the Cup; and the said Medal shall bear an inscription specifying the Show at

Carry forward £388

Brought forward £388

which, the date on which, and the name of the animal with which the Challenge Cup has been won, as well as the name of the owner.

In name of the Council of the Clydesdale Horse Society,

ARCHD. MACNEILAGE, *Secretary*.

¹ Breeder of Best Clydesdale Brood Mare—The Robert Murdoch Prize, value £10.

President's Medal for best Clydesdale Mare or Filly.

Class	HUNTERS.	Premiums.			
		1st.	2nd.	3d.	
		£	£	£	
49.	Colt, Gelding, or Filly, foaled in 1900, the produce of thoroughbred Stallions, out of Mares of any breed,—Five Prizes ² —£10, £7, £5, £2, £1.				
50.	Filly, Mare, or Gelding, for field, foaled in 1899— <i>in hand</i> .	8	5	3	
51.	Yeld Mare, Filly, or Gelding for field, foaled in 1898— <i>in hand</i> .	8	5	3	
³	Best Hunter Filly in Classes 49, 50, and 51—Gold Medal, value £10, 10s.				
⁴	Best Colt or Gelding in Classes 49, 50, and 51—£10.				
52. ⁵	Hunter Brood Mare, with foal at foot or to foal this season—£15, £8, £4.				32
	<i>President's Medal for best Hunter.</i>				

HACKNEYS.

(*All to be shown in hand.*)

53.	Brood Mare, 15 hands and upwards, with Foal at foot, or to foal this season to a registered Sire .	10	6	4	
54.	Brood Mare, under 15 hands, with Foal at foot, or to foal this season to a registered Sire . . .	10	6	4	
					40
	Carry forward				£460

¹ Request by the late Miss Murdoch.

² Given by Sir John Gilmour of Montrave, Bart.

³ Given by the Hunter Improvement Society.

⁴ Given by Mr C. D. Stewart of Brin.

⁵ Given by Captain Clayhills Henderson of Invergowie, R.N.

Class	HACKNEYS— <i>continued</i> .	Brought forward £460		
		Premiums.		
		1st.	2nd.	3rd.
		£	£	£
55.	Yeld Mare or Filly, foaled in 1898.	8	5	3
56.	Filly, foaled in 1899	8	5	3
57.	Filly, foaled in 1900	8	5	3
58.	Stallion, foaled in or before 1898, over 15 hands	10	6	4
59.	Stallion, foaled in or before 1898, over 14 and not over 15 hands . .	10	6	4
60.	Entire Colt, foaled in 1899.	8	5	3
61.	Entire Colt, foaled in 1900.	8	5	3
		<hr/>		
		120		

All animals entered in the above Hackney Classes must be registered in the Hackney Stud-book except in Classes 57 and 61, and animals entered in Classes 57 and 61 must be eligible for entry in the Hackney Stud-book.

- ¹ Gold Medal, value £10, by Hackney Horse Society for best Mare or Filly in Hackney or Pony Classes.

President's Medal for best Hackney.

PONIES.

62.	Stallion, 3 years old and upwards, over 12, not exceeding 14 hands — <i>in hand</i>	5	3	2
63.	Yeld Mare, Filly, or Gelding, 3 years old and upwards, over 13 and not over 14½ hands— <i>in saddle</i>	5	3	2
64.	Yeld Mare, Filly, or Gelding, 3 years old and upwards, over 12 and not over 13 hands— <i>in saddle</i>	5	3	2
65.	Stallion, 3 years old and upwards, 12 hands and under— <i>in hand</i> . .	5	3	2
66.	Yeld Mare, Filly, or Gelding, 3 years old and upwards, 12 hands and under— <i>in saddle</i>	5	3	2
		<hr/>		
		50		

President's Medal for best Pony.

Carry forward £630

¹ A Mare 6 years old or more must have had a living foal. Winners of the Hackney Society's Gold Medals in 1901, except at the London and Royal English Shows, excluded. The winner must be entered or accepted for entry in Hackney Stud-book, and certified free from hereditary disease. The Gold Medal being of the intrinsic value of £10, that amount will be paid by the Hackney Horse Society at any time if the Medal be returned in good condition.

Brought forward £630

HIGHLAND PONIES.

Class

67. ¹ Pony Stallion, not exceeding 14.2 hands, best adapted to get ponies, out of Highland Pony Mares, suitable for Mounted Infantry—Prize of £20.

It is provided that the Stallion which wins this Prize shall serve Highland Pony Mares in 1902, in such of the counties of Elgin, Nairn, Inverness, Ross, Sutherland, and Caithness, and at such centres as may be hereafter arranged by the Society, at the following fees—viz.: 1 guinea per mare, with a further fee of one guinea per foal.

68. ¹ Highland-Bred Pony,² any age, Yeld Mare or Gelding, not exceeding 14.2 hands, suitable for Mounted Infantry—First Prize, £12; Second Prize, £5; Third Prize, £3.

SHETLAND PONIES.

Premiums.
1st. 2nd. 3rd.
£ £ £

(All to be shown in hand.)

- | | | | |
|--|---|---|---|
| 69. Stallion, not exceeding 10½ hands, foaled before 1897 . . . | 5 | 3 | 2 |
| 70. Entire Colt, not exceeding 10½ hands, foaled in 1897 or 1898 . . . | 5 | 3 | 2 |
| 71. Mare, not exceeding 10½ hands, with foal at foot . . . | 5 | 3 | 2 |
| 72. Yeld Mare, not exceeding 10½ hands . . . | 5 | 3 | 2 |
| 73. Filly, not exceeding 10½ hands, foaled in 1897 or 1898 . . . | 5 | 3 | 2 |

50

- ³ Silver Cup, value £10, 10s., for best four-in-hand team of Shetland Ponies, to be driven in the ring, the Ponies being drawn from the ordinary classes, from "Extra Stock," or from both these Sections.

President's Medal for best Shetland Pony.

DRIVING COMPETITIONS.

- | | | | |
|--|----|---|---|
| 74. Yeld Mare, Filly, or Gelding, in Harness, 15 hands and upwards, to be driven in the ring . . . | 10 | 5 | 3 |
| 75. Yeld Mare, Filly, or Gelding, in Harness, under 15 hands, to be driven in the ring . . . | 10 | 5 | 3 |

36

*President's Medal for best animal in the Classes for Horses in Harness.*⁴

£716

¹ Given by Lord Tweedmouth.

² The term "Highland-bred Pony" is here held to mean Ponies bred in one or other of the following counties—viz.: Argyll, Perth, Forfar, Kincardine, Aberdeen, Banff, Elgin, Nairn, Inverness, Ross and Cromarty, Sutherland, Caithness, and Orkney and Shetland.

³ Given by Mr Fletcher of Rosehaugh.
⁴ An animal that has won a President's Medal in another section in this Show shall not be eligible to compete for the Medal in this section.

JUMPING COMPETITIONS

SPECIAL REGULATIONS.

(See also the Regulations on pages 53 to 64.)

1. Jumping Competitions will take place on the afternoons of Wednesday, Thursday, and Friday, the 17th, 18th, and 19th July.
2. Entries for each day's Competitions will close at the Secretary's Office in the Showyard at 6 p.m. on the preceding day.
3. *Entry Fees.*—For classes for Horses—Wednesday, £1; Thursday and Friday, 10s. for each class. Pony classes—Wednesday, 10s.; Thursday and Friday, 5s. for each class.
4. An animal that wins a prize in the Open Class cannot compete in the Pony Class, or vice versa.
5. *Accommodation* for jumping horses will be provided as follows :—Covered shed in which to stand during the day free of charge; or, on application to the Secretary not less than seven days before the opening of the Show, stalls or loose-boxes will be provided at a charge (in addition to the Entry Fee) of £1 for a stall, and £1, 10s. for a loose-box, which must be paid along with the Entry Fee at the time of application.
6. Horses entered for jumping only need not enter the Showyard till 12 noon on the day of Competition, and may leave the Showyard at 6 p.m. each day.
7. *The Jumps* may consist of Single Hurdle, Gate, Double Hurdle, Wall, and Water Jump, power being reserved by the Society to alter these, as well as the Handicaps, as may be thought desirable.

WEDNESDAY.

Class	1st. £	2nd. £	3rd. £
1. Horses—open	20	10	5
2. Ponies, 14.3 hands and under	10	5	3

THURSDAY.

3. Horses, Open Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize in Class 1.	10	6	3
4. Ponies, 14.3 hands or under, Handicap, hurdles and gate being raised 4 inches for first prize winner in Class 2	5	3	1

FRIDAY.

5. Horses, Open Handicap, hurdles and gate being raised 8 inches for the winner of the first prize, and 4 inches for the winner of the second prize in either of Classes 1 or 3—4 inches extra for the winner of the two first prizes in Classes 1 and 3	10	6	3
6. Ponies, 14.3 hands or under, Handicap, hurdles and gate being raised 4 inches for the winner of the first prize in Class 2 or in Class 4, and 8 inches for winner of the first prize in both these Classes	5	3	1

Champion Prize for most points in Prizes with one or more horses in above Classes—First Prize to count three points; Second Prize, two points; and Third Prize, one point. The money to be evenly divided in the event of a tie

10 0 0

£110

SHEEP

BLACKFACED.		Premiums.			
Class		1st.	2nd.	3rd.	4th.
		£	£	£	£
76.	Tup above one shear . . .	12	8	4	2
77.	Shearling Tup . . .	12	8	4	2
78.	Ewe above one shear, with her Lamb at foot . . .	10	5	2	—
79.	Shearling Ewe or Gimmer . . .	10	5	2	—
		<hr/>			
<i>President's Medal for best pen of Blackfaced Sheep.</i>					

CHEVIOT.

80. Tup above one shear	.	.	12	8	4	2
81. Shearling Tup	.	.	12	8	4	2
82. Ewe above one shear, with her Lamb at foot	.	.	10	5	2	—
83. Shearling Ewe or Gimmer	.	.	10	5	2	—

President's Medal for best pen of Cheviot Sheep.

BORDER LEICESTER.

84. Tup above one shear	.	.	12	8	4	2
85. Shearling Tup	.	.	12	8	4	2
86. Ewe above one shear	.	.	10	5	2	—
87. Shearling Ewe or Gimmer	.	.	10	5	2	—

President's Medal for best pen of Border Leicesters.

86

HALF-BRED.

88. Tup above one shear	.	.	12	8	4	2
89. Shearling Tup	.	.	12	8	4	2
90. Ewe above one shear	.	.	10	5	2	—
91. Shearling Ewe or Gimmer	.	.	10	5	2	—

¹ Best Half-bred Tup in above Classes—£5.
¹ Best Half-bred Ewe or Gimmer in above Classes—£5.
President's Medal for best pen of Half-Breds.

Carry forward £344

¹ Given by Breeders, per Mr Bertram.

Class		Class	
BRAHMAPOOTRA . . .	11. Cock	GAME—	
	12. Hen	<i>Old English</i> . . .	51. Cock
BRAHMA or COCHIN . . .	13. Cockerel		52. Hen
	14. Pullet	<i>Indian</i> . . .	53. Cock
SCOTCH GREY . . .	15. Cock		54. Hen
	16. Hen	<i>Modern</i> . . .	55. Cock
	17. Cockerel		56. Hen
	18. Pullet	<i>Any Variety, including Old English and Indian</i> . . .	57. Cockerel
HAMBURG—			58. Pullet
<i>Black</i> . . .	19. Cock	BANTAM—	
	20. Hen	<i>Game, any Variety, including Old English and Indian</i> . . .	59. Cock
<i>Any other Variety</i> . . .	21. Cock		60. Hen
	22. Hen	<i>Any other Variety Bantam</i> . . .	61. Cock
<i>Any Variety</i> . . .	23. Cockerel		62. Hen
	24. Pullet	ANY OTHER RECOGNISED BREED OF POULTRY . . .	63. Cock
PLYMOUTH ROCK . . .	25. Cock		64. Hen
	26. Hen		65. Cockerel
	27. Cockerel		66. Pullet
	28. Pullet	DUCKS—	
MINORCA . . .	29. Cock	<i>Aylesbury</i> . . .	67. Drake
	30. Hen		68. Duck
	31. Cockerel		69. { Drake (Young)
	32. Pullet		70. { Duck (Young)
LEGHORN—		<i>Rouen</i> . . .	71. Drake
<i>White</i> . . .	33. Cock		72. Duck
	34. Hen	<i>Any other Variety</i> . . .	73. Drake
<i>Any other Variety</i> . . .	35. Cock		74. Duck
	36. Hen	<i>Any Breed (Aylesbury excepted)</i> . . .	75. { Drake (Young)
<i>Any Variety</i> . . .	37. Cockerel		76. { Duck (Young)
	38. Pullet	GESE . . .	77. Gander
LANGSHAN . . .	39. Cock		78. Goose
	40. Hen	TURKEYS . . .	79. Cock
ORPINGTON . . .	41. Cock		80. Hen
	42. Hen		
LANGSHAN or ORPINGTON	43. Cockerel		
	44. Pullet		
WYANDOTIE—			
<i>Gold or Silver</i> . . .	45. Cock		
	46. Hen		
<i>Any other Variety</i> . . .	47. Cock		
	48. Hen		
<i>Any Variety</i> . . .	49. Cockerel		
	50. Pullet		

Amount of Poultry Premiums, £140.

DAIRY PRODUCE

No Exhibitor to show more than one lot in any Class.

Class	Premiums.			
	1st.	2nd.	3rd.	4th.
1. Cured Butter, not less than 7 lb.	£ 4	£ 2	£ 1	—
2. Powdered Butter, not less than 7 lb.	£ 4	£ 2	£ 1	—
3. Fresh Butter, three 1-lb. rolls	£ 4	£ 2	£ 1	—
4. Cheddar Cheese, 56 lb. and upwards	£ 6	£ 4	£ 2	£ 1
5. Cheddar Cheese, 14 lb. and under	£ 3	£ 2	£ 1	—
				£40

ABSTRACT OF PREMIUMS.

(22 Champion Medals given by DONALD CAMERON OF LOCHIEL.)

GIVEN BY THE SOCIETY.

1. Cattle	£818 0 0
2. Horses	716 0 0
3. Jumping	119 0 0
4. Sheep	440 0 0
5. Swine	66 0 0
6. Poultry	140 0 0
7. Dairy Produce	40 0 0
8. Medals to Breeders, &c.	20 0 0

£2359 0 0

CONTRIBUTED PRIZES.

1. The Shorthorn Society	£20 0 0
2. Northern Shorthorn Breeders	20 0 0
3. Sir George Macpherson Grant, Bart.	50 0 0
4. The late Mr C. Macpherson Grant of Drumduan	50 0 0
5. Polled Cattle Society	10 0 0
6. Mr Macpherson of Corrimony	10 0 0
7. Cawdor Challenge Cup	52 10 0
8. Bequest by late Miss Murdoch	10 0 0
9. Sir John Gilmour, Bart.	25 0 0
10. Captain Clayhills Henderson	27 0 0
11. Hunters' Improvement Society	10 10 0
12. Mr C. D. Stewart of Blin	10 0 0
13. Hackney Horse Society	10 0 0
14. Lord Tweedmouth	40 0 0
15. Mr J. D. Fletcher of Roschaugh	10 10 0
16. Breeders of Half-bred Sheep	10 0 0
17. Oxford-Down Sheep-Breeders' Association	13 0 0
18. Suffolk Sheep Society	20 0 0
19. Breeders of Shropshire Sheep	10 10 0
20. Sir Robert Menzies, Bart.	18 0 0
21. Tweeddale Gold Medal	20 0 0

447 0 0

£2806 0 0

JAMES MACDONALD, *Secretary.*3 GEORGE IV BRIDGE,
EDINBURGH, *February 1901.*

**The Society's Show for 1902 will be held at
Aberdeen on the 15th, 16th, 17th, and 18th
July.**

MEMBERS ADMITTED IN JUNE 1900 AND JANUARY 1901.

1. ADMITTED JUNE 6, 1900.

- Adam, David, of Craignannet, Denny.
 Adie, Mountfor W. J., Voc, Shetland.
 Aitchison, John, Agricultural Student, Bog-
 end, Duns.
 Aitken, Thomas, The Grove, St Ninian's,
 Stirling.
 Allan, Alexander, Seafield Farm, Inverness.
 Allan, John, Meadowend, Clackmannan.
 Anderson, William, M. R.C. V.S., Keith.
 Archibald, Adam, Overshiels, Stow.
 Armstrong, John, Queensferry Street Lane,
 Edinburgh.
 Arnott, David, jun., Friarton, Newport, Fife.
 Arnott, Patrick, Friarton, Newport, Fife.
 Arnott, Patrick Ramsay, Tillyrie, Milna-
 thort.
 Baird, Major E. W., Exning House, New-
 market.
 Ballantyne, Thomas, Kilmartin Hotel, Kil-
 martin.
 Ballingall, David, jun., Blair-Drummond,
 Perthshire.
 Barns-Graham, Allan, yr., Craigallian, Miln-
 gavin.
 Begg, Hugh, V.S., East Kilbride.
 Bickerton, Henry N., National Gas Engine
 Co. Ltd., Ashton-under Lyne.
 Blair, Alexander, 198 West George Street,
 Glasgow.
 Blair, David, Claylands, Balfroun.
 Bontein, James Shelley, of Glenerruitten, Oban.
 Bouglas, Henry Brown, Banker, Carlisle.
 Bowie, James, Whitefauls, Torrance of
 Campsie.
 Breckenridge, Alexander, South Onthank,
 Kilmarnock.
 Brown, John, Dalderse Farm, Falkirk.
 Buchan, William, Biel Grange, Prestoukirk.
 Buchanan, Frank H., Pauans, Tainuult.
 Cadzow, James, Stonehill, Crawfordjohn,
 Abington.
 Cairns, A. J., St Benneath, Blackford.
 Cairns, Robert, St Mungos, Auchterarder.
 Cairns, William, Dalchrum, Comrie.
 Cameron, Duncan, Bows, Dunblane.
 Campbell, John, Queensgate, Inverness.
 Campbell, Robert, Auchenbowie, Stirling.
 Campbell, Samuel, Lochelour, Crieff.
 Carswell, John, Dykes, Stirling.
 Cawdor, Earl, Cawdor Castle, Nairn.
 Chisholm, D. M., Pitglassie, Dingwall.
 Christie, Harry Duncan, Gordon Terrace,
 Craigmillar Park, Edinburgh.
 Clark, Alexander, Stonehouse, Bothkennar,
 Carron.
 Clark, John Stewart, Dundas Castle, South
 Queensferry.
 Clark, Walter, Hilton of Delines, Nairn.
 Clark, William, Wester Bogie, Kirkcaldy.
 Colquhoun, John, Midross, Luss.
 Coulter, Charles M., Walter A. Wood M. &
 R. M. Co., 36 Worship Street, London,
 E.C.
 Cowan, R., Erchless, Beaully.
 Cowieson, William, Millseat, Craigston, Tur-
 rif.
 Crawford, Robert, of Newbank, Trinity.
 Curr, David, Merrylee, Cathcart.
 Denovan, Robert, Main Street, Bannock-
 burn.
 Dewar, Andrew, King's Park, Stirling.
 Dewar, John W., King's Park, Stirling.
 Duncan, John L., Mill of Ogilvie, Blackford.
 Elliot, Andrew Stirling, Hollybush, Gala-
 shiels.
 Elliot, David P., Nesbit Hill, Duns.
 Fleming, Alexander, Enoch, Eaglesham.
 Fleming, Andrew, Threepland, Eaglesham.
 Fyfe-Jamieson, James F., Old Ballikintain,
 Balfroun.
 Forrest, James, Whitesones, Cumminestown.
 Forsyth, R. W., Corrie, Arran.
 Fraser, Alexander, Raith, Kirkcaldy.
 Fulton, John, Balmule, Burntisland.
 Galbraith, Alexander, 14 Port Street, Stirling.
 Gossip, James A., Knowsley, Inverness.
 Graham, George, Faraway, Port of Monteith.
 Graham, James E. M., Tarbert, Lochfyne.
 Grant, James, Arradoul, Buckie.
 Gray, Henry, Hawkhill Farm, Kincardine-on-
 Forth.
 Hamilton, Andrew, Brucehaven, Dunfermline.
 Hamilton, Jas. T., Portend, Lake of Monteith.
 Hamilton, John, Low Mams, East Kilbride.
 Hardie, Wm., jun., Gallowridge Hill, Dun-
 fermeline.
 Harvie, Alex., Shieldhill, Newton-Mearns.
 Hetherington, Wm., 14 Port Street, Stirling.
 Hood, John, Anfield, Cross-gates, Fife.

- Horsburgh, John, Aberlour House, Fifeshire.
 Howe, Jas. M., Castle Heather, Inverness.
 Hunter, John, Union Bank, Elgin.
 Inglis, James, Barnslea, Markinch.
 Ireland, David, East Tullyfergus, Alyth.
 Kerr, J. Ernest, Harvieston Castle, Dollar.
 King, James, Bridgeend, Dunblane.
 King, J. W., yr. of Campsie, Auchentree, Cardross.
 Laird, John, Caskieberran, Leslie.
 Latta, Robert M., Blairquhosh, Blanefield.
 Lyon, Wm., Nether Drumgley, Forfar.
 Macadam, Arch., Blairrow, Drymen Station.
 Macadam, John, Bank House, Balfon.
 McCowan, James, Ashentree, Kippen Station.
 Macdonald, John, Marypark, Balmalloch.
 MacDonald, Simon, Commercial Bank, Beaully.
 Macdonald, Wm., Cluny Mans, Kingussie.
 McFeat, Robert, Offers Farm, Gargunnoch, Stirling.
 McGrigor, Alexander, Beechwood, Stirling.
 McIntyre, James, Logan Mains, Ardwell.
 McIntyre, Peter, Tighmclair, Comrie.
 McKay, John, Barone Park, Bute.
 McKelvie, James, Hatton House, Kirkcubrighton.
 Mackintosh, D., Auctioneer, Dingwall.
 Mackintosh, D. M., Platehaig, Beaully.
 McLagan, W. J., East Mid-Lammerkin, Perth.
 McLaren, Duncan, West Bracklunn, Callander.
 McLennan, Wm., Ardnamrack, Muir of Ord.
 McLeod, Wm., Rosebank, Maryhill.
 Macmillan, Allister, Lochranza, Arian.
 McNaughton, Robert, 9 Douglas Ter., Stirling.
 McNiven, Duncan, Lockfield, Doune.
 Macpherson, Donald, Keppoch Farm, Arisaig.
 MacKae, Duncan, Falls of Trum, Newtonmore.
 McWilliam, Wm. L., Culmhill, Beaully.
 Mair, John, Carriek Lodge, Mount Vernon, Lanarkshire.
 Marshall, Wm., Glenwhommie, Dunblane.
 Martin, James, Keithrick Mills, Coupar-Angus.
 Meikle, John, Craigne, Clackmannan.
 Meiklen, John, Thorn House, Johnstone.
 Miller, James, St Ninian's Well, The Brewery, Stirling.
 Mills, C. S., Tore Mains, Allan Grange, Munlochy.
 Milne, Alexander, Pickerton, Lyrie.
 Mirrles, Arthur, Forthland Estate Office, Kilmarnock.
 Mitchell, Andrew, Dobbie & Co., Rothesay.
 Mitchell, James P., Carrat, Stirling.
 Mitchell, John, Greenyards, Dunblane.
 Moir, Arch. Patrick, Bank Street, Alloa.
 Monteath, Robert, Biggs, Blackford.
 Morgan, Andrew, Estates Office, Glamis.
 Morrison, John, Teanalong, Beaully.
 Murray, E. Mackenzie, Woodside House, Coupar-Angus.
 Nicholson, Edward Henry, Col. 4th Notts V B., Sherwood Foresters, Newark-on-Trent.
 Nicol, Arthur, P., Craigsia, Alyth.
 Orr, George William, Portland Estate Office, Kilmarnock.
 Panton, John, H.M. General Prison, Perth.
 Pate, James, Allerstocks, Strathaven.
 Paterson, Alex., Hill of Drip, Stirling.
 Peddie, William, F.R.C.V.S., Cathcart.
 Peterkin, John W., Dunglass, Canon Bridge.
 Philip, W. W., Estate Office, Gigha, Argyllshire.
 Pollock, Alexander, Tarbolton, Ayrshire.
 Prain, John, Mains of Castle Huntly, Longforgan.
 Purdom, James T., Easter Wooden, Roxburgh.
 Reid, Alexander, Morlee, Blairgowrie.
 Reid, James, Nether Tulloch, Laurencekirk.
 Reid, William, Duninnau Estate Office, Balbeggie, Perth.
 Renton, John R., Schoolmaster, Clackmannan.
 Riddell, Matthew, 435 Gallowgate, Glasgow.
 Risk, John, 18 Park Crescent, Stirling.
 Risk, John, Culmore, Kippen, Stirling.
 Ritchie, William, Teawig, Beaully.
 Robertson, Jas., Orchardhead, Inverkeithing.
 Robertson, John, jun., Old Blair, Blair Atholl.
 Robinson, J. F., Coldoch, Blair-Drammond, Perthshire.
 Robley, W. P., 100 High John Street, Glasgow.
 Rollo, D. M., Solicitor, Cupar-Fife.
 Rollo, W., Easter Forret, Cupar-Fife.
 Ross, Chas. D. M., Abercraigne Estate Office, Crieff.
 Roxburgh, Alexander, Solicitor, Alloa.
 Sandilands, William, Green, Carnwath.
 Sempell, John D., Chief Constable, County Buildings, Stirling.
 Sharp, Thomas Mercer, Bardrill, Blackford.
 Shorthouse, Alexander, Hillside, Kinross.
 Sma, John Roy, Spring Grove, Dundee.
 Smith, R. A., Wester Lovat, Beaully.
 Smith, William, Logiebrae, Blairgowrie.
 Soutar, James Gordon, Westhall, Dundee.
 Soutar, John, jun., Leuchlands, Brechin.
 Spalding, William, of Balcannel, Brechin.
 Stark, Thomas, Luthieills, Bishopbriggs.
 Stewart, Gordon, Chyne, Stonehaven.
 Stewart, James, Friarton, Perth.
 Stewart, John, Curriet, Eaglesham.
 Stewart, M. Muir, 11 Eglinton Crescent, Edinburgh.
 Stewart, Thomas, Ardoch, Eaglesham.
 Stirling, James, Doghapple, Thornhill, by Stirling.
 Stirling, John A., of Kippendavie, Dunblane.
 Storrar, Christopher, Easter Lathrisk, Freuchie.
 Strang, Wm., 103 West Regent Street, Glasgow.
 Thomson, David, of Greenhill, Alloa.
 Thomson, William Wilson, Cocklaw, East Lothian.
 Thornton, G. B., of Feddall (78 Princes Street, Edinburgh).
 Todd, A. Enever, Stoneybank, Musselburgh.
 Waddell, Robert, Barnsdale Cottage, St Ninians.
 Walker, William R., Tharnton, Kilmn.
 Watson, Alexander, Greenhill, Eaglesham.
 Watson, James, 5 Clarendon Terrace, Dundee.
 Watson, John, Craighton, Clackmannan.
 Watt, Arthur, Lockhart-Fields, East Kilbride.
 Watt, James W., Drumgray, Airdrie.
 Watt, John, Knocklandside, Kilmarnock, Ayrshire.
 Watt, John A., Drumgray, Airdrie.
 Watt, Thomas, Drumgray, Airdrie.
 Weir, John, Schoolmaster, Tullhadden.
 Willison, Douglas Acharn, Kilmn.
 Willoughby de Eresby, Lord Glenartney, Comrie.
 Wilson, James, Tundergarth Mains, Lockerbie.
 Wilson, Robert, Kilmahanty, Dalbeattie.
 Wilson, Robert, Multhead of Pitcullo, Cupar-Fife.
 Young, John, Greenlees, Cambuslang.

2. ADMITTED JANUARY 9, 1901.

Ainslie, James, Tor, Murrayfield, Edinburgh.
 Alexander, James, Bents, Laurencekirk.
 Alexander, James, Hermisgaith, Sanday, Orkney.
 Andrew, M., Drumrore, Glassary, Lochgilphead.
 Annand, James M., Newton, Glamis.
 Anstruther-Duncan, Colonel A.W., Naughton, Dundee.
 Bain, James, Palace Hotel, Aberfeldy.
 Barker, George, Engineer, Perth.
 Bell, John, Dornock House, Annan.
 Bell, Robert Nixon, Newton, Kirkpatrick-Fleming, Ecclefechan.
 Bell, William, C.E., Aberfeldy.
 Black, Wm. Rose, Town and County Bank, Elgin.
 Blake, Charles E., 36 Worship Street, London, E.C.
 Blinkhorn, John F., Stitches, Hawick.
 Brook, Alexander William, Corn Merchant, Invergordon.
 Brown, Arch., Achnaba, Lochgilphead.
 Brownlie, John, Garrison Grain Mills, Wishaw.
 Cameron, R. W. G., Drumharvey, Auchterarder.
 Campbell, Alex., Viewhill, Fort-George.
 Campbell, Andrew, Farmers' Mart Limited, Brechin.
 Carlyle-Bell, A., Craigs, Dumfries.
 Cheape, George Ronald Hamilton, Carsaig, Isle of Mull.
 Clark, Alexander, Blackpark, Nairn.
 Crawford, Robert, Upper Largie, Kilmartin.
 Crichton, Charles Matland, of Lathinsk, Falkland, Fife.
 Cuthbertson, John, National Bank Buildings, Kilmarnock.
 Denny, William, Caddoulee, Galashiels.
 Dickson, William E., Torphichen Arms Inn, Mid-Calder.
 Drummond, Robert, Pocknave, Craigue, Ayrshire.
 Eadie, John, Blair Mains, Stirling.
 Finlayson, Roderick, Ardachie, Tain.
 Fletcher, A., Laudale, Strontian, Ardgour, R.M.O., Argyllshire.
 Fletcher, Donald, Kinnaird, Brechin.
 Foden, Edwin, Elworth Works, Sandbach.
 Fraser, John, Inverardran, Cranlanich.
 Gall, Thomas, Prince of Wales Hotel, Alloa.
 Gibson-Matland, Miss, of Barnton, Sauchieburn, Stirling.
 Gifford, Thomas, West Briggs, Kirkliston.
 Glen, Robert, Carlston, Keltinside, Glasgow.
 Graham, Hugh M., Solicitor, Inverness.
 Graham, James, Mains of Baldoon, Dundee.
 Grant, George Rodger, Auchnacree, Brechin.
 Gray, John, Auchinlay, Dunblane.
 Guthrie, W. M., of Duart, M.P., Isle of Mull.
 Henderson, James W., Clarkson Farm, Doune.
 Hill, Thos. A., jun., Boarhills, St Andrews.
 Hogarth, James, Engineer, Prior Bank, Kelso.
 Holms-Kerr, William, 79 St George's Place, Glasgow.
 Keith, Marshall J., Estate Office, Mertoun, St Boswells.
 Knox, R. W., Moorpark, Kilbirnie.
 Learmonth, James, Ellerslie, Falkirk.

Lockhart, John, Colinton Mains, Colinton.
 Logan, Wm., V.S., 3 Victoria Circus, Inverness.
 M'Cormick, Duncan, Fincharr, Ford, Argyllshire.
 Macfarlane, James, Millhall, Stirling.
 M'Gilchrist, Jas., Home Farm, Ballindalloch.
 Mackay, William, Solicitor, Inverness.
 Mackie, John, Dalbible Farm, Dumfries.
 M'Killican, James, Glenlyon, Nairn.
 M'Lachlan, John, Doune Lodge, Doune.
 M'Laren, Hugh, Blackhill Villa, Aberfeldy.
 M'Laren, Laurence, M.R.C.V.S., Brechin.
 Maclean, R., of Drynie, Inverness.
 M'Leod, James Munro, Wallace, Fraser, & Co., Ironmongers, Tain.
 M'Leod, Captain R., of Cadboll, Invergordon Castle, Invergordon.
 M'Neill, D., Drumdrishag, Ormsary, Ardrishag.
 M'Queen, William, Shigarton, Kippen.
 Marshall, Allan, Mid Leicopt, Bridge of Allan.
 Marshall, James M'L., 29 Queensgate Gardens, London, S.W.
 Menzies, James, Cull, Aberfeldy.
 Millar, Robert, Torbhlairen, Glassary, Lochgilphead.
 Miln, George P., Milnholme, Chester.
 Monteath, John, Wright Park, Kippen.
 Muir, James, Backaskail, Sanday, Orkney.
 Mundell, Charles, Dalchork, Lairg, Sutherlandshire.
 Mundell, Walter, Dalchork, Lairg, Sutherlandshire.
 Nixon, William, Farm School, Lower Mill Farm, Basing, Basingstoke.
 Paterson, William, Mains of Foulis, Evanton.
 Pearson, Douglas, Rockvilla Oil Mills, Glasgow.
 Peat, Alexander, Manor, Blairlogie, Stirling.
 Ritchie, James Smith, 1 Commercial Street, Dundee.
 Robertson, John, Kirkland, Forgue, Huntly.
 Sangster, John, Aberdeen Commercial Company, Aberdeen.
 Scott, James, Mains of Raddery, Fortrose.
 Scott, J. Elliot, Newton, Cromarty.
 Scott, William, jun., Newbridge, Ratho.
 Shiers, Geoffrey C., Canford Estate Office, Wimborne, Dorset.
 Simpson, John, Halfakill, Tynehead.
 Stewart, R. T., Banker, Tain.
 Stewart-Mackenzie, Col. J., of Seaforth, Brahan Castle, Conon Bridge.
 Strachan, George, Montecroft Mains, Banff.
 Thomson, James Meikle, East Neveay, Meikle.
 Tocher, James, Blairnorie, Cawdor, Nairn.
 Urnston, Chas. Hanson, W.S., 19 Merchiston Place, Edinburgh.
 Ward, W. Cowper, Sear, Sanday, Orkney.
 Watson, George, Little Head Hill, Kierriemuir.
 Weatherstone, John, Airfield, Dalkeith.
 White, Robert S., Halkerston, Gorebridge.
 Wright, John, Market Gardener, Preston, Prestonpans.
 Young, James, Peatland, Dundonald.
 Young, W., Skerrington Mains, Hurlford.
 Young, Matthew, Grain Merchant, Stewarton, Ayrshire.

FREE LIFE MEMBERS ADMITTED JUNE 6, 1900.

Allisen, Herbert W., Golden Gates, Wynyard,
Stockton-on-Tees.

Bruce, William, B.Sc., Laurencekirk.

Burtou John H., Ingletou, Darlington.

Galloway, William, Braxfield Road, Lan-
ark.

Hatrick, J. Montgomerie, 60 John Street,
Glasgow.

Jackson, William, Heath Fern, Wolston,
Coventry.

Jardine, Warburton C., 20 Doune Terrace,
North Kelvinside, Glasgow.

Lloyd-Williams, William R., Gwerclas,
Corwen, North Wales.

Mackenzie, Edward J., John o' Groats.

Pimlett, Jas., Agric., [redacted] Wood, Holmes
Chapel, Cheshire.

Rushton, John C., [redacted], Hilderstone,
Stone, Staffs.

Smith, Fred., 115 Brook Street, Macclesfield,
Cheshire.

Wale, Bernard N., Brewwood, Stafford.

Wood, James, Ruchlaw West Mains, Preston-
kirk.

TOTAL NUMBER OF MEMBERS, 6108.

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